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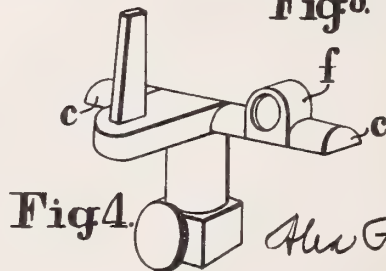
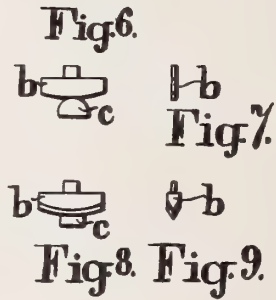
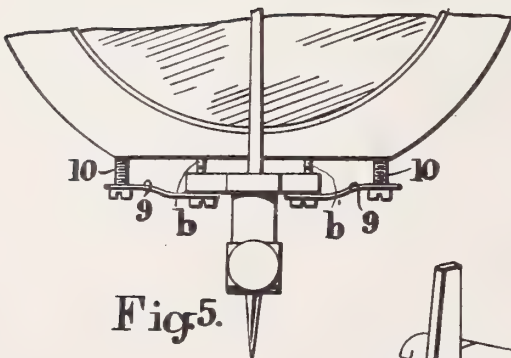
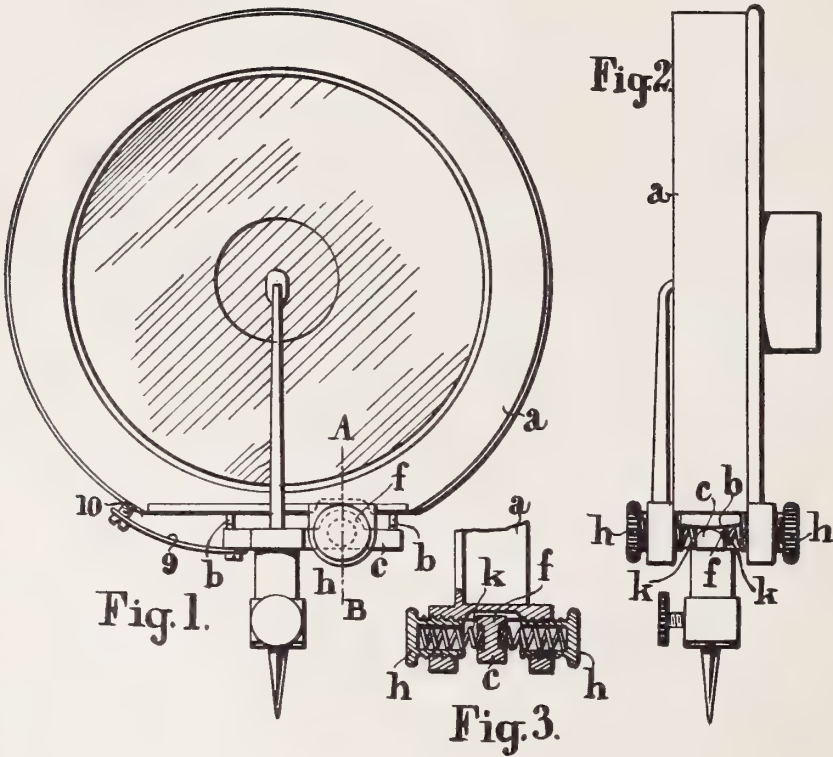




A. FISCHER.  
SOUND BOX FOR TALKING MACHINES.  
APPLICATION FILED OCT. 18, 1909.

1,013,145.

Patented Jan. 2, 1912.



Witnesses  
B. B. Collings.  
Jas. E. Dodge.

Fig. 4. Inventor  
A. Fischer,  
by William Fisher & Witherspoon  
Attorneys.

# UNITED STATES PATENT OFFICE.

ALEX FISCHER, OF KENSINGTON, LONDON, ENGLAND.

## SOUND-BOX FOR TALKING-MACHINES.

1,013,145.

Specification of Letters Patent.

Patented Jan. 2, 1912.

Application filed October 18, 1909. Serial No. 523,243.

*To all whom it may concern:*

Be it known that I, ALEX FISCHER, a subject of the King of England, residing at 8 Maclise road, Kensington, in the county of London, England, have invented certain new and useful Improvements in the Construction of Sound-Boxes for Talking-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to sound boxes for talking and like machines and has for its object to improve the connections between the stylus bar and sound box disclosed in my Patent #904,523, November 24, 1908.

To these ends the invention consists in the novel details of construction and combinations of parts more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification in which like letters refer to like parts in all the views:—Figure 1 is an elevational view of a sound box made in accordance with my invention; Fig. 2 is a side view of the same; Fig. 3 is a sectional detail view of certain parts; Fig. 4 is a perspective view of the spindle and connecting parts; Fig. 5 is a view of a modified form of the invention; and Figs. 6, 7, 8, and 9 are views of the bearings for the spindle.

*a* is the shell of the sound box provided with convex bearing surfaces formed of thin plates or blocks *b*. It will be observed from the various figures that these bearing surfaces *b* are convex instead of concave as in my patent above, and form parts of a circle, the radius of which is equal to the vertical distance between the point of connection of the stylus bar with the diaphragm and the surface of the spindle nearest thereto.

*c* is the spindle which may be circular, partly circular, rectangular or of any other convenient shape in cross section.

*k* shows the spiral controlling springs, *h* shows hollow nuts and *f* shows a small arm. The arm *f* projects inwardly from the spindle toward the sound box, and the spiral controlling springs *k* are above the axis of the spindle as shown at Figs. 1 to 4. The shell of the sound box may be hollowed

out to accommodate the small arm *f*, see Fig. 3.

To render the mounting of the end of the spindle *c*, which is farther from the springs *k*, more efficient, I fix to the underside thereof, that is the side opposite the bearing side, one end of a flat spring 9 the other end of which is provided with a slot through which a screw 10 fixed to the casing of the sound box passes.

Referring now to the form shown in Fig. 5, which is intended more especially for the construction of a cheaper sound box than that already described, in this case the springs *k*, hollow nuts *h* and brackets *g* shown in my patent before mentioned are dispensed with and in their place a second flat spring 9 is attached at the side of the spindle opposite the bearing surfaces and at the opposite end to the first spring 9.

Referring to the details shown at Figs. 6 to 9, Fig. 6 shows a convex bearing with a partly circular spindle end resting thereon. Fig. 8 shows a convex bearing with the spindle end rectangular in cross section resting thereon. Figs. 7 and 9 show two forms of bearing surfaces, which may be formed of thin metal plates, as will be seen from Fig. 7, or thicker plates with beveled edges, as shown in Fig. 9, so as to reduce the bearing surface to a desired suitable size.

Although I have explained my invention as applied to a sound box such as that described and shown in the specification of my former aforesaid Letters Patent, I wish it to be understood that I do not intend to confine the application of the herein specified improvements to such sound boxes, only, but I desire it to be understood that I may employ convex bearing surfaces with spindle ends circular, partly circular, rectangular or of other suitable shape in cross section also with sound boxes of other construction.

By the construction shown the spindle *c* has both a rocking movement on the curved bearings *b* and also a pendulous-like swinging movement thereon which enables the needle to follow the record accurately and respond thereto with great delicacy so that the finest shades of tone may be reproduced by the diaphragm.

What I claim and desire to secure by Letters Patent of the United States of America, is:—

1. In a sound box for talking machines, 110



the combination with a casing and its diaphragm of a stylus bar attached to the diaphragm, a spindle carried by the stylus bar, and a pair of convex guide bearings for the spindle on the casing each having a bearing surface curved in the arc of a circle whose radius is approximately equal to the distance between the point of connection of the stylus bar with the diaphragm and the surface of the spindle nearest thereto, whereby the spindle has both a rocking movement on said bearings and also a pendulous swinging movement thereon.

2. In a sound box for talking machines, the combination with a casing and its diaphragm of a stylus bar attached to the diaphragm, a spindle carried by the stylus bar, a pair of convex guide bearings for the spindle on the casing each having a bearing surface curved in the arc of a circle whose radius is approximately equal to the distance between the point of connection of the stylus bar with the diaphragm and the surface of the spindle nearest thereto, and adjustable

yielding devices pressing said spindle against its bearings.

3. In a sound box for talking machines, the combination with a casing and its diaphragm of a stylus bar attached to the diaphragm, a spindle carried by the stylus bar, a pair of convex guide bearings for the spindle on the casing each having a bearing surface curved in the arc of a circle whose radius is approximately equal to the distance between the point of connection of the stylus bar with the diaphragm and the surface of the spindle nearest thereto, an arm projecting inwardly from the spindle toward the casing, and yielding devices carried by the casing pressing on opposite sides of said arm.

In testimony whereof, I affix my signature, in presence of two witnesses.

ALEX FISCHER.

Witnesses:

A. E. VIDAL,

L. SIMMONDS.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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A. FISCHER.  
TALKING MACHINE SOUND BOX.  
APPLICATION FILED JAN. 17, 1910.

1,013,146.

Patented Jan. 2, 1912.

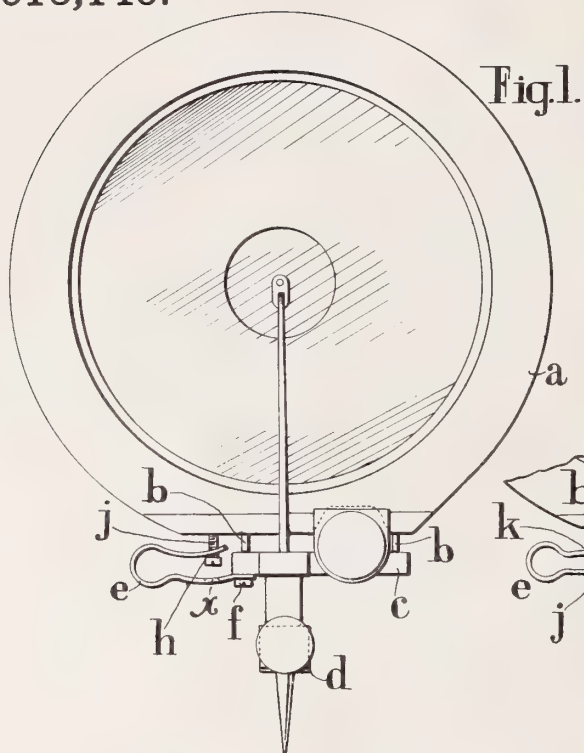


Fig. 1.

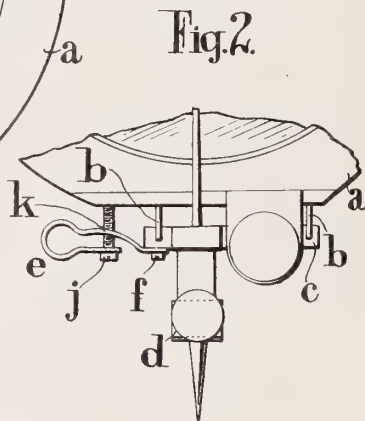


Fig. 2.

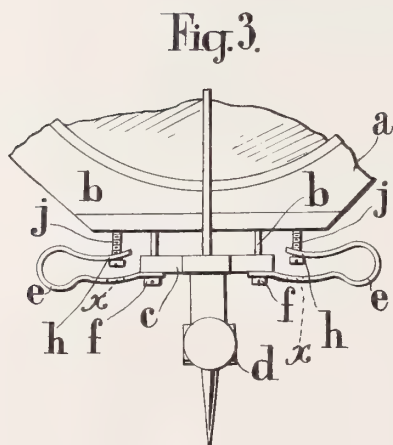


Fig. 3.

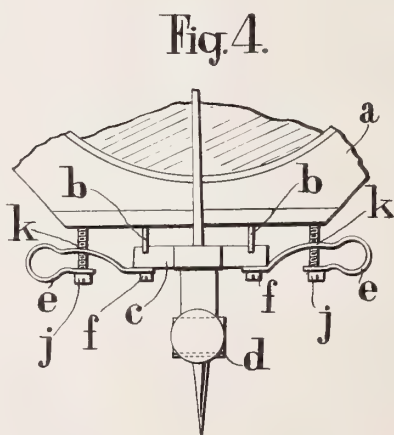


Fig. 4.

Witnesses:  
J. S. Ginston  
A. W. Neale, Jr.

Inventor:  
Alex. Fischer  
By Williamson, Drake & Witherspoon  
his attorneys

# UNITED STATES PATENT OFFICE.

ALEX FISCHER, WEST KENSINGTON, LONDON, ENGLAND.

TALKING-MACHINE SOUND-BOX.

1,013,146.

Specification of Letters Patent.

Patented Jan. 2, 1912.

Application filed January 17, 1910. Serial No. 538,496.

*To all whom it may concern:*

Be it known that I, ALEX FISCHER, a subject of the King of England, residing at 8 Maclise road, West Kensington, in the  
5 county of London, England, have invented certain new and useful Improvements Relating to Talking-Machine Sound-Boxes; and I do hereby declare the following to be a full, clear, and exact description of the  
10 invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to talking machine sound boxes and refers to an arrangement  
15 by means of which an extremely sensitive springing of the stylus bar and its associated parts may be effected.

The improvement is applicable to any sound box which has a rocking plate, a  
20 spindle or the like in connection with the stylus holder, and the essential principle of the invention is to so adapt a spring or springs in connection with the said rocking plate, spindle or the like that such  
25 spring or springs keep the rocking plate, spindle or the like pressed upon its seating, without a tendency to tilt the plate or spindle upon such seating.

According to one way of carrying out  
30 my invention, I employ a flat spring, one end of which, is doubled back over itself, the other end being preferably screwed to the rocking plate or the like. The spring toward the bent over end is slotted in two  
35 places, and an adjustable screw is passed through the slots into the shell of the sound box, or into lugs or the like formed on the sound box shell. Other devices engaging the bent over end of the spring may also be  
40 employed.

According to another way of carrying out my invention, I double back a flat spring under itself, and in place of passing a screw through a slot in one bend of  
45 the spring and again through the spring and into the shell of the sound box or into a lug attached thereto, I pass a screw or the like through the bent under end of the spring not connected to the rocking plate  
50 or the like, thus attaching this end of the spring directly to the sound box or to a lug attached thereto, such attachment being fixed or movable by means of a slot in the end of the spring as may be desired; a hole  
55 may be made in the bend of the spring coming over the end thus attached in order to

facilitate the fixing and adjustment of the screw.

The invention may be applied to sound boxes generally, but is especially suitable  
60 for application to a sound box of the type for which I obtained Letters Patent No. 904523. And in order that my said invention may be better understood, I will now proceed to describe the same with reference  
65 to the drawing accompanying this specification, in which—

Figure 1, is a plan view of one form of the invention; Fig. 2, is a like view of a slightly modified form of the invention;  
70 Fig. 3, is a view similar to Fig. 1, but employing two springs; and, Fig. 4, is a view similar to Fig. 2, but also employing two springs.

Referring to the drawings:—*a* represents  
75 the shell of the sound box.

*b* are guide bearings.

*c* is a spindle to which is attached a stylus holder *d*.

*e* is a spring doubled back under itself,  
80 as shown, with one end attached to the spindle *c* beneath the bearing surface at *f*. The spring *e* is perforated or slotted at *h*. *j* is a screw passing through this perforation or slot into the shell *a* of the sound box.  
85 When desired a hole *x* may be made in the part of the spring coming opposite the screw *j* to facilitate the fixing and adjustment of the said screw *j*.

Referring to the form of the device shown  
90 at Fig. 2, in this case the spring *e* is doubled back over itself, as will be seen from the drawing and one end is again attached beneath the bearing surface *f*. At the other  
95 end the screw *j* passes through a perforation or slot at *k* in the spring into the shell of the sound box.

The form of the device shown at Fig. 3 is similar to that shown at Fig. 1, except that two springs *e* and associated parts are  
100 provided and attached at each end of the spindle *c*, and the small arm controlled by springs described in connection with my aforesaid former Letters Patent is dispensed  
105 with.

The form of the device shown at Fig. 4, is similar to that shown with respect to Fig. 2, but here again the two springs *e* are provided, one at each end of the spindle *c*, and the aforesaid arm controlled by springs is  
110 also dispensed with.

The bent under springs shown at Figs. 1



and 3 are different in action to the bent over springs shown at Figs. 2 and 4, as when the screw *j* is tightened in the first case, the other end of the spring is pulled toward the bearing surfaces, while when it is tightened in the latter case, the other end of the spring is pressed down, both forms have, however, the function of keeping the rocking plate, spindle or the like in contact with the bearing surfaces.

I prefer to attach the end of the spring or springs beneath the bearing surface at *f* and in the longitudinal axis of the rocking plate or spindle, as shown on the figures, but to suit requirements it may be attached to the other side, the bearing side, of the rocking plate or spindle, or in any other position, where flat springs or other spring devices are generally employed on sound boxes.

It will be observed that in each of the modifications of the invention shown in the drawings the spring is made of a flat piece of spring metal bent upon itself and having two substantially parallel arms, one of which is rigidly secured to the spindle and the other adjustably secured to the casing in such manner that the spring itself may rock at its end about a fulcrum approximately in line with the axis about which the spindle rocks. In this way the spindle is accurately held on its bearings with a yielding pressure which may be given a very delicate adjustment. The preferred construction and one which has now been very extensively used is shown in Fig. 3. This construction although it differs only slightly from the others gives far better results. In this case the ends of the springs engaged by the screws *j* are approximately in line with the edges of the bearings *b* so that when the spindle rocks a rocking motion is given to the springs about an axis substantially in line with the axis about which the spindle turns.

It will be understood that I may vary the shape of the spring provided that it is of such nature as described and shown.

Although I have described the invention as applied to a sound box of the type described in my former aforesaid Letters Patent it will be understood that I may adopt a spring or springs of the kind described wherever suitable to sound boxes for the purpose of exerting a pressure upon a rocking plate or spindle and holding same in this way on bearings such as knife edges, points, domes or other supporting devices.

What I claim and desire to secure by Letters Patent of the United States of America, is:—

1. In a sound box for talking machines the combination with a casing and its dia-

phragm of a stylus bar connected with the diaphragm, a spindle carried by the stylus bar and arranged transversely thereto, bearing surfaces on the casing on which the spindle rocks, and a spring consisting of a flat piece of metal bent upon itself and having two substantially parallel arms parallel with the spindle and one of which is rigidly secured to the spindle and the other adjustably secured to the casing but held approximately in line with the spindle.

2. In a sound box for talking machines, the combination with a casing and its diaphragm of a stylus bar connected with the diaphragm, a spindle carried by the stylus bar and arranged transversely thereto, bearing surfaces on the casing on which the spindle rocks, a spring made of a metal strip bent upon itself and having one end attached to one end of the spindle and the other end connected with the casing by adjustable devices which hold it approximately in line with the axis of rotation of the spindle, and means for yieldingly supporting the opposite end of the spindle.

3. In a sound box for talking machines the combination with a casing and its diaphragm, of a stylus bar connected with the diaphragm, a spindle carried by the stylus bar and arranged transversely thereto, bearing surfaces on the casing on which the spindle rocks, and a spring at each end of the spindle made of a metal strip bent upon itself and having one end attached to one end of the spindle and the other end connected with the casing by adjustable devices which hold it approximately in line with the axis of rotation of the spindle.

4. In a sound box for talking machines the combination with a casing and its diaphragm of a stylus bar connected with the diaphragm, a spindle carried by the stylus bar and arranged transversely thereto, bearing surfaces on the casing on which the spindle rocks, and a spring projecting from each end of the spindle and each made of a metal strip bent upon itself and having one end attached to one end of the spindle and the other end arranged approximately in line with the axis of rotation of the spindle, and adjustable screws engaging the free ends of the springs and attaching them to the casing, said springs being formed with openings opposite the heads of the screws to facilitate the screw adjustment, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

ALEX FISCHER.

Witnesses:

A. E. VIDAL,

H. E. G. ROWLEY.



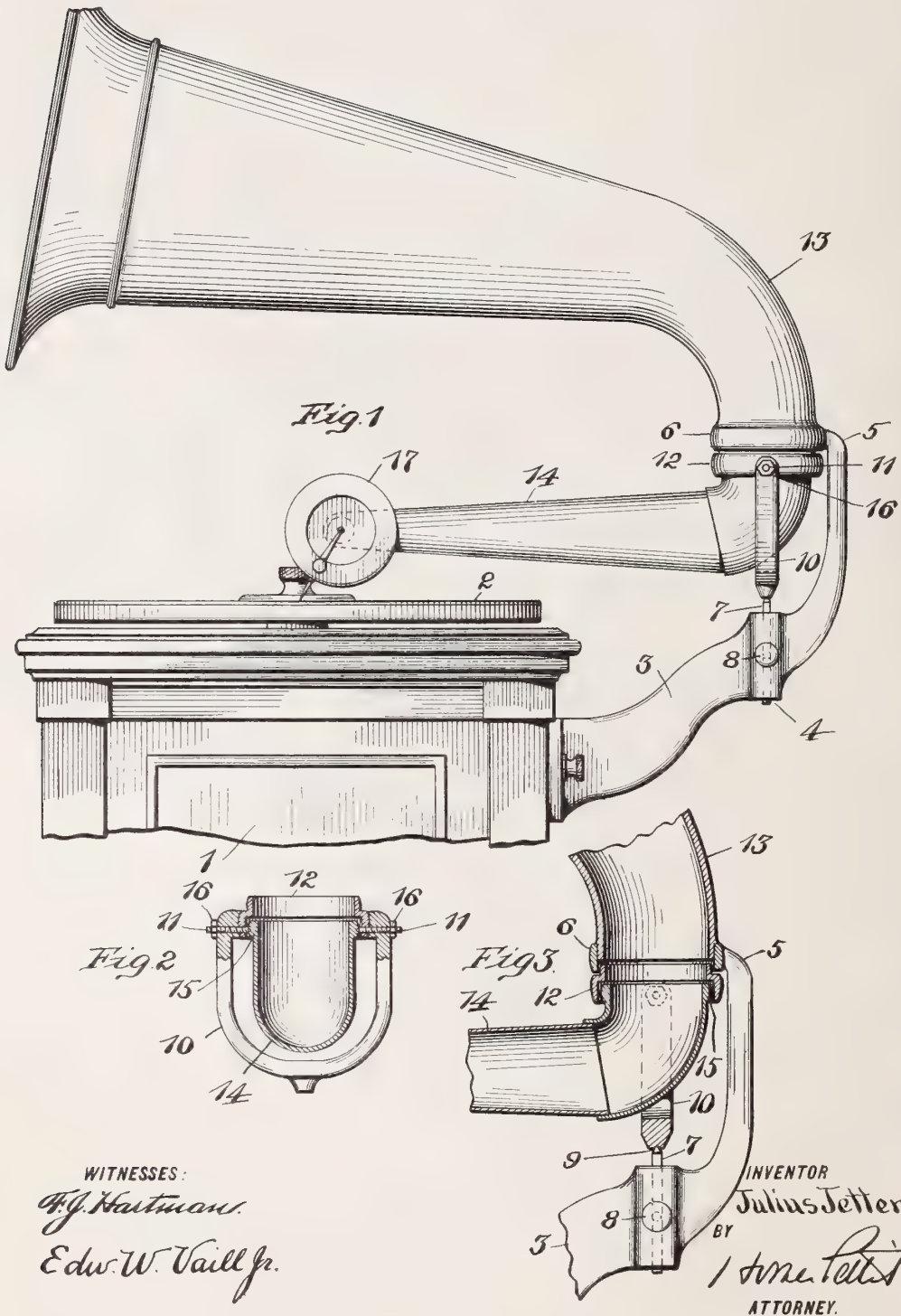


J. JETTER.  
TALKING MACHINE.

APPLICATION FILED APR. 28, 1904. RENEWED MAY 11, 1910.

1,013,170.

Patented Jan. 2, 1912.



WITNESSES:  
*H. J. Hartman.*  
*Edw. W. Vaill Jr.*

INVENTOR  
Julius Jetter  
BY  
*James T. T. T.*  
ATTORNEY.

# UNITED STATES PATENT OFFICE.

JULIUS JETTER, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, OF CAMDEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## TALKING-MACHINE.

1,013,170.

Specification of Letters Patent.

Patented Jan. 2, 1912.

Application filed April 28, 1904, Serial No. 205,277. Renewed May 11, 1910. Serial No. 560,731.

*To all whom it may concern:*

Be it known that I, JULIUS JETTER, a citizen of the United States, and a resident of the city of Camden, State of New Jersey, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, clear, and complete disclosure.

The main objects of this invention are to provide in a talking machine an improved sound-box arm and mounting therefor; and to provide other improvements as will appear hereinafter.

In the accompanying drawings Figure 1 is a side elevation of a talking machine embodying this form of my invention. Figs. 2 and 3 are views illustrating details of construction, certain parts being shown in section.

Referring to the drawings, one embodiment of this invention comprises the usual casing 1 which contains the usual spring motor, or other actuating mechanism, which is connected by a vertical spindle extending through the top of the casing with the usual horizontal turntable 2 arranged above the casing.

Attached exteriorly to the rear vertical wall of the casing 1 and extending laterally and upwardly therefrom is a bracket or support 3 which is provided intermediate its ends with a vertical opening 4 extending transversely therethrough. The upper portion 5 of the bracket curves inwardly and terminates in a fixed horizontal ring or collar 6 which may be integral therewith.

Within the opening 4 in the bracket 3 is a vertically adjustable pin 7 which is held rigidly in position within the opening by means of a set screw 8. The upper end of the pin 7 is in the form of a conical bearing 9 which engages the lower end of an upwardly extending yoke 10. Each of the two arms of the yoke 10 is provided adjacent its upper end with a screw 11 threaded horizontally therethrough, the screw of each arm being spaced from and in longitudinal alinement with the screw of the other arm. These screws 11 project diametrically through the opposite walls respectively of a collar 12.

The collar 12 is arranged coaxially with the fixed ring or support 6, the upper portion of the collar being reduced in external and internal diameters and telescoping ro-

tatably in the lower portion of the ring 6 and the lower portion of the collar 12 projecting downwardly from and outside of the ring 6. The annular external shoulder between the upper and lower portions of the collar 12 is adapted to engage against the lower edge of the ring 6.

Projecting upwardly from the fixed collar 6 and supported thereby is the usual or any suitable amplifying horn 13. The smaller end of the horn 13 is reduced externally in diameter and fits snugly within the upper portion of the ring 6.

A tapering tubular sound-box arm or tone arm 14 is provided, which has surrounding its larger end an outwardly extending flange 15 exteriorly in the form of a spherical zone which fits loosely within the cylindrical opening in the lower end of the rotary collar 12, and is provided with diametrically opposite sockets in which engages respectively the conical inner ends of the screws 11. Each of the screws 11 is provided outside of the yoke with a nut 16 for locking the screw in position with respect to the yoke.

The smaller end of the tone arm is provided with the usual or any suitable sound-box or sound reproducer 17, which is arranged to cooperate with a sound record carried by the turntable 2.

From the foregoing description, it is evident that in this construction the smaller end of the tone arm together with the sound-box 17 carried thereby may be moved freely vertically, the spherical flange 15 of the larger end of the tone arm moving easily within the collar 12 on a horizontal axis about the conical ends of the screws 11, and also that the free end of the tone arm and the sound-box carried thereby may be moved freely horizontally across the record support, the collar 12 turning freely within the fixed ring 6, together with the yoke 10, about a vertical axis coincident with the axis of the ring 6 and with the longitudinal axis of the pivot 7. This construction provides a continuous unobstructed and practically sound tight conduit from the sound-box 17 to the amplifying horn 13, which is free from sharp corners and through which sound waves may be transmitted without being divided or modified in any manner by pins, cross-bars or other parts such as have been used in some instances heretofore and which will allow the sound waves to proceed



smoothly from the sound-box through the amplifying horn with a gradual increase in wave front.

Although only a single form has been illustrated in which this invention may be embodied, the invention is not limited to any particular construction but may be applied in various forms without departing from the spirit of the invention or the scope of the appended claims.

Having thus fully described this invention, I claim and desire to protect by Letters Patent of the United States:

1. In a talking machine, the combination with a sound conveying tube, of a substantially cylindrical member with which said tube telescopes, a support carrying said member, said support and member being movable about the axis of the latter and of said tube, and pivots for said tube extending diametrically from said cylindrical member.

2. In a talking machine, the combination with a hollow sound conveying tube, of a collar within which said tube fits, a yoke supporting said collar and tube, said yoke, collar, and tube having devices which connect them together, so that said tube is pivotally retained in position, and a support having an opening therein within which a portion of said collar is retained.

3. In a talking machine, the combination with a hollow sound conveying tube, having a flange at one end thereof, of a collar having a cylindrical opening therein, within which said flange fits loosely, a yoke pivoted to turn on a vertical axis, said yoke having pivot screws which pass therethrough, and through said collar, and engage said flange pivoting said tube upon a horizontal axis, and a fixed support having an opening within which a portion of said collar fits.

4. In a talking machine, the combination with a hollow sound conveying tube, of a collar which telescopes with one end of said tube, a yoke, pivot devices carried by said yoke, and engaging both said tube and said collar, forming a bearing to permit said tube to turn on a horizontal axis, a fixed support having an opening therein with which said collar telescopes, and a vertical pivot for said yoke.

5. In a talking machine, the combination with a hollow sound conveying tube having a spherical flange at one end thereof, a collar within which said flange fits loosely, a yoke pivoted to turn on a vertical axis, set screws passing through the ends of said yoke and through said collar and engaging said flange, pivoting the same upon a horizontal axis, and a fixed support telescoping with said collar.

6. In a talking machine, the combination with a hollow sound conveying tube, of a collar with which said tube telescopes so

as to prevent the escape of sound waves, a yoke for supporting said collar, said yoke, collar and tube having devices which connect them together pivotally, and a support having an opening therein, said support also adapted to telescope with said collar.

7. In a sound recording or reproducing machine, a suitably supported supporting ring, a collar telescoping with said ring, a hollow arm telescoping with said collar, and rotatable means supporting said collar in revoluble relation to said ring and said arm to swing relatively vertically.

8. In a talking machine, the combination with a sound conveying tube, of a substantially cylindrical member in which said tube telescopes, a support carrying said member, said supporting member being movable about the axis of the latter and of said tube, pivots for said tube extending diametrically from said cylindrical member, and means for vertically adjusting said support.

9. In a talking machine, the combination with a fixed member provided with an opening, of a rotatable collar having a portion extending in said opening, and a portion projecting downwardly from said fixed member, a hollow sound-box arm having one end telescoping with the lower portion of said collar, means outside of said fixed member connecting said collar to said end of said sound-box arm and arranged to restrain said tone arm to swing upon a substantially horizontal axis fixed with respect to said collar, and means arranged beneath said collar for holding said collar against movement downwardly.

10. In a talking machine, the combination with a fixed member provided with an opening, of a rotatable collar having a portion extending in said opening, and a portion projecting downwardly from said fixed member, a hollow sound-box arm having one end telescoping with the lower portion of said collar, means outside of said fixed member connecting said collar to said end of said sound-box arm and arranged to restrain said tone arm to swing upon a substantially horizontal axis fixed with respect to said collar, and vertically adjustable means arranged beneath said collar for adjusting said collar vertically and for holding said collar against movement downwardly.

11. In a talking machine, the combination with a substantially horizontal fixed ring of a collar rotatable about its longitudinal axis and having a substantially cylindrical reduced portion engaging in said ring and a lower portion projecting downwardly from said ring, a hollow tone arm having one end engaging in the said lower portion of said collar, a pair of horizontally aligned pivots projecting diametrically through the opposite walls of said lower portion of said collar respectively and engaging said end of

said hollow tone arm, and a yoke mounted to swing about a vertical axis and supporting said collar.

12. In a talking machine, the combination  
5 with a substantially horizontal fixed ring of a collar having a substantially cylindrical reduced upper portion engaging in said ring and a substantially cylindrical lower portion projecting downwardly from said ring, a  
10 hollow tone arm having one end engaging in the said lower portion of said collar, a pair of horizontally alined pivots projecting

diametrically through the opposite walls of said lower portion of said collar respectively and engaging said end of said hollow tone 15 arm and a vertically adjustable yoke mounted to swing about a vertical axis and supporting said collar.

In witness whereof I have hereunto set my hand this 20th day of April, A. D. 1904. 20

JULIUS JETTER.

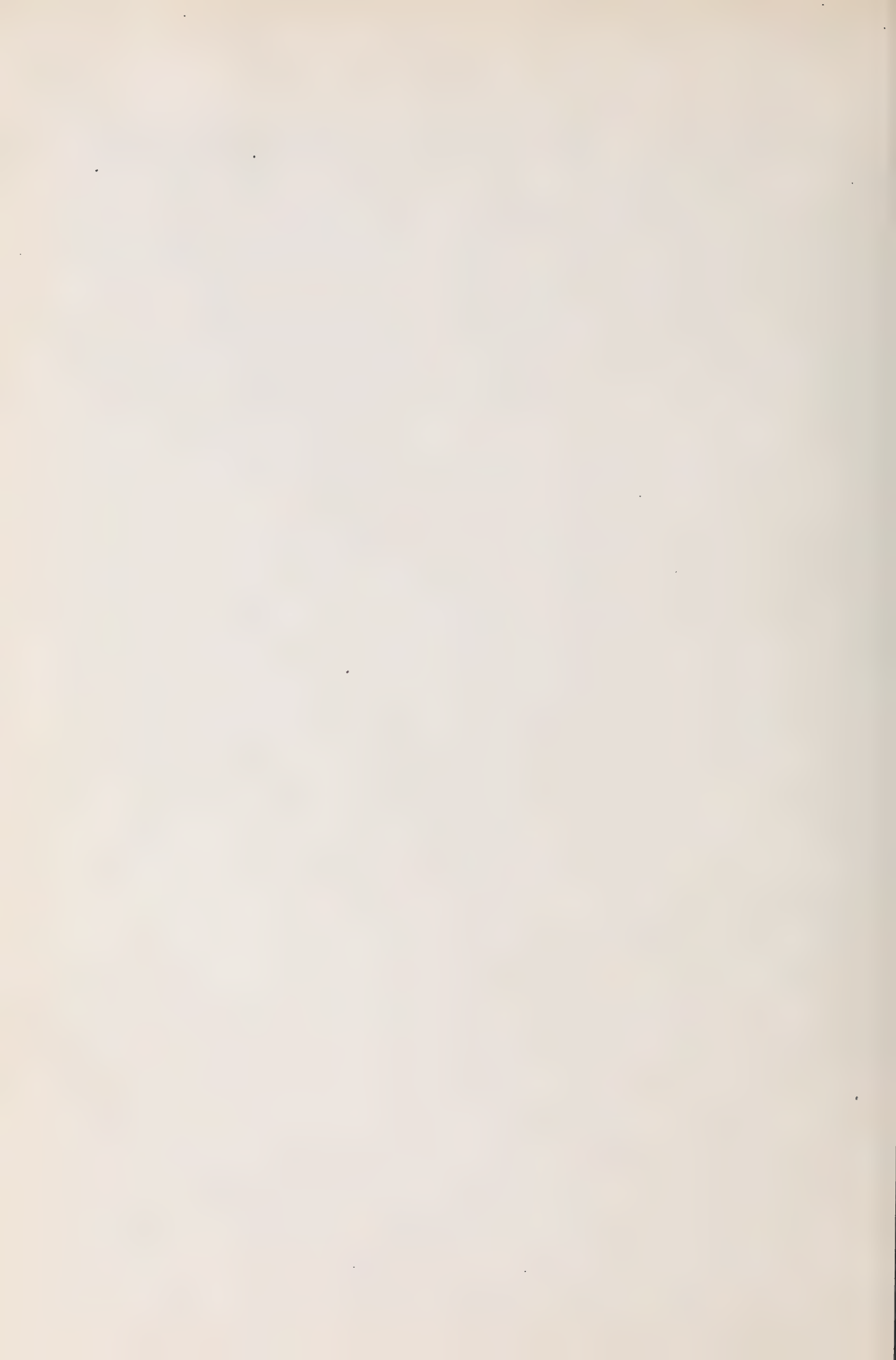
Witnesses:

LEWIS H. VAN DUSEN,  
EDW. W. VAILL, Jr.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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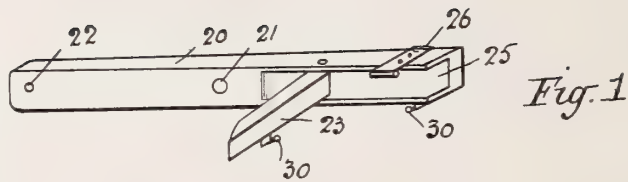




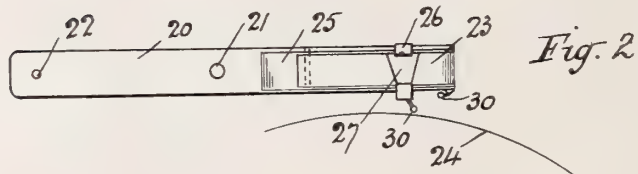
E. E. MEADOWCROFT.  
 STYLE BAR FOR PHONOGRAPHS.  
 APPLICATION FILED SEPT. 3, 1909.

1,013,198.

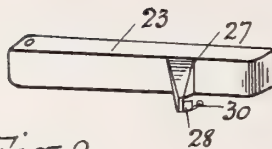
Patented Jan. 2, 1912.



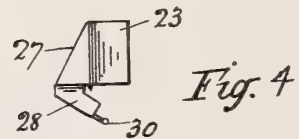
*Fig. 1*



*Fig. 2*



*Fig. 3*



*Fig. 4*

WITNESSES:

*H. H. Berrigan*  
*F. Hogan*

INVENTOR,  
 EDWARD ERNEST MEADOWCROFT,  
 by *Ivan Olden*  
 Attorney.

# UNITED STATES PATENT OFFICE.

EDWARD ERNEST MEADOWCROFT, OF HOBART, TASMANIA, AUSTRALIA.

## STYLE-BAR FOR PHONOGRAPHS.

1,013,198.

Specification of Letters Patent.

Patented Jan. 2, 1912.

Application filed September 3, 1909. Serial No. 516,108.

*To all whom it may concern:*

Be it known that I, EDWARD ERNEST MEADOWCROFT, a subject of the King of Great Britain, residing at 121 Bathurst street, Hobart, Tasmania, Australia, have invented certain new and useful Improvements in Style-Bars for Phonographs, of which the following is a specification.

This invention has been devised for the purpose of utilizing two styles on the same style bar in phonographs and like machines, so that it may be possible to play ordinary two minute and also the long four minute records without altering the bar except to bring the required style into contact with the record.

Referring to the accompanying drawings, Figure 1 is a perspective view of the style bar, according to the present invention, showing an additional style bar attached thereto and in open, inoperative position. Fig. 2 is a side elevation of the same showing the additional style bar in closed operative position. Fig. 3 is a perspective view of the additional style bar, detached, and Fig. 4 is an end view of the same.

In operation, the style-bar 20 is fulcrumed at 21 and connected with the reproducer at 22. In order to provide for a second style upon the main bar, I hinge or otherwise movably connect thereto an additional style bar 23 and adapt it to be brought into, or thrown out of touch with the record 24, as desired. One style is upon the bar 20 and another upon the additional bar 23. When not in use, the latter is swung out away from 20, but when the style upon 23 is to be used its bar is brought into the groove 25 in the bar 20 and locked therein by means of the flat spring 26.

To assist the spring in keeping the extra bar in the groove, the bar 23 is provided with a projecting member 27, the face of which inclines outward from the upper edge of the bar. The edge of the spring 26 finds a bed upon the inclined face of the projection 27 and when it is necessary to pull the bar 23 away from bar 20, the inclined face of 27 will assist in effecting the release from the spring. The member 27 is also provided with a tail piece 28 which carries the extra style.

By means of the slot or recess 25 and the spring 26 the extra style bar 23 will be securely and effectively housed during action. The groove 25 should be such as to insure that the bar 23 shall comfortably fit therein without being free to move loosely.

In applying the invention to the different machines it may be necessary to somewhat modify the arrangement of parts to suit the smaller construction but this may be done without departing from the spirit and scope of the invention as claimed.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a talking machine of the class indicated, in combination, a main style bar, a style thereon, an additional bar carrying a second style and hinged to the main bar and capable of being closed in upon said main part to constitute one bar and means for locking said additional bar to said main bar, for the purpose explained.

2. In a talking machine of the class indicated, in combination, a main style bar in which is a deep longitudinal groove, an additional style bar hinged to the main bar and capable of reposing in said groove, and a flat steel spring secured to and overlapping the main bar transversely and extending over the edge of the additional bar when the latter is housed in the groove, as described.

3. In a talking machine of the class indicated, in combination, a main style bar that has a deep longitudinal groove in one of its sides, a style on the main bar, an additional bar carrying an extra style and hinged to the first and adapted to come into the groove, a projecting member on said additional bar the face of which inclines from the upper edge of said bar and a flat spring transversely disposed on and projecting from the principal bar and which is adapted to engage upon said inclined face, as set forth.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

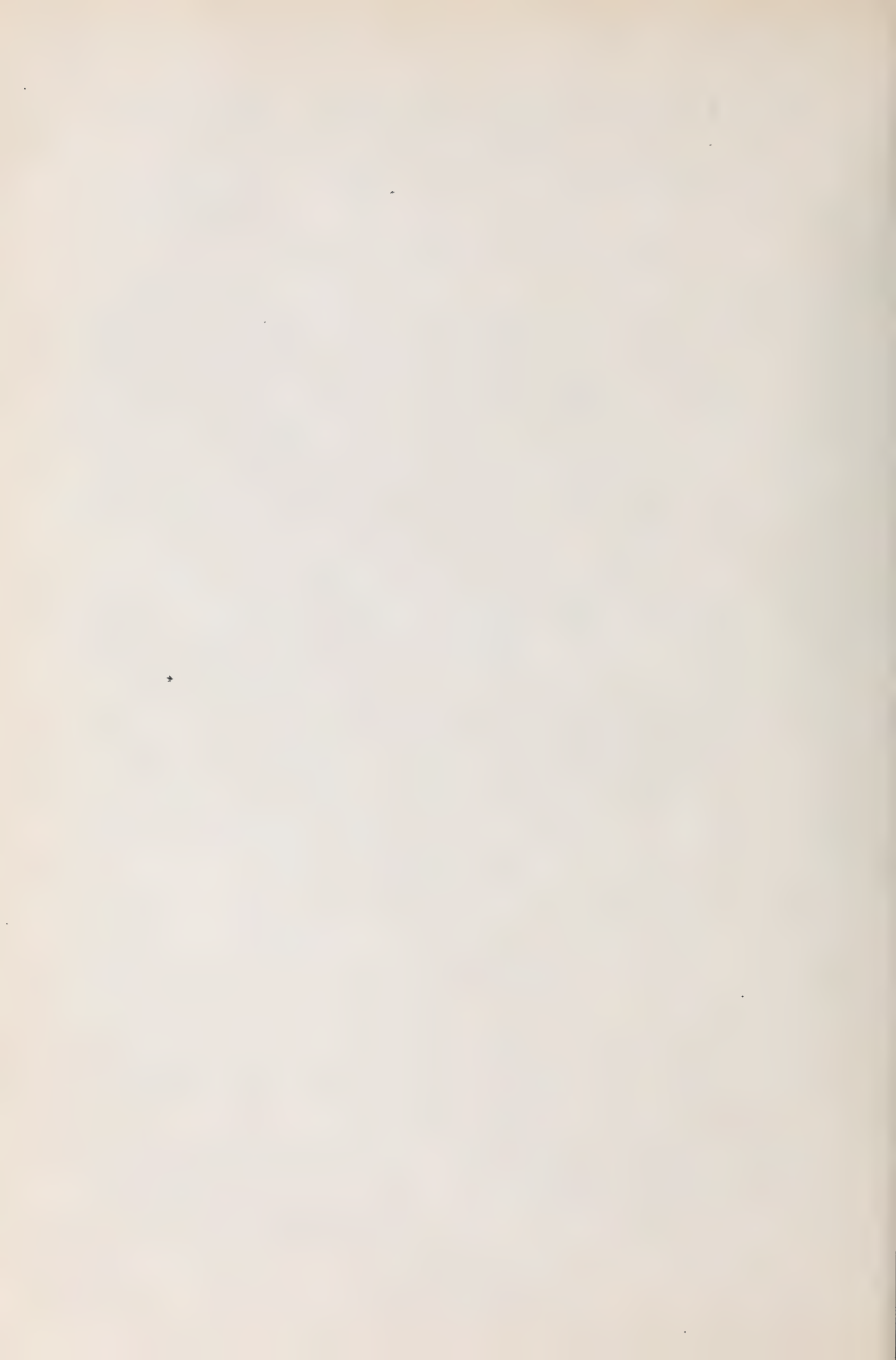
EDWARD ERNEST MEADOWCROFT.

Witnesses:

I. B. ПОСОВК,

H. C. TAPPING.

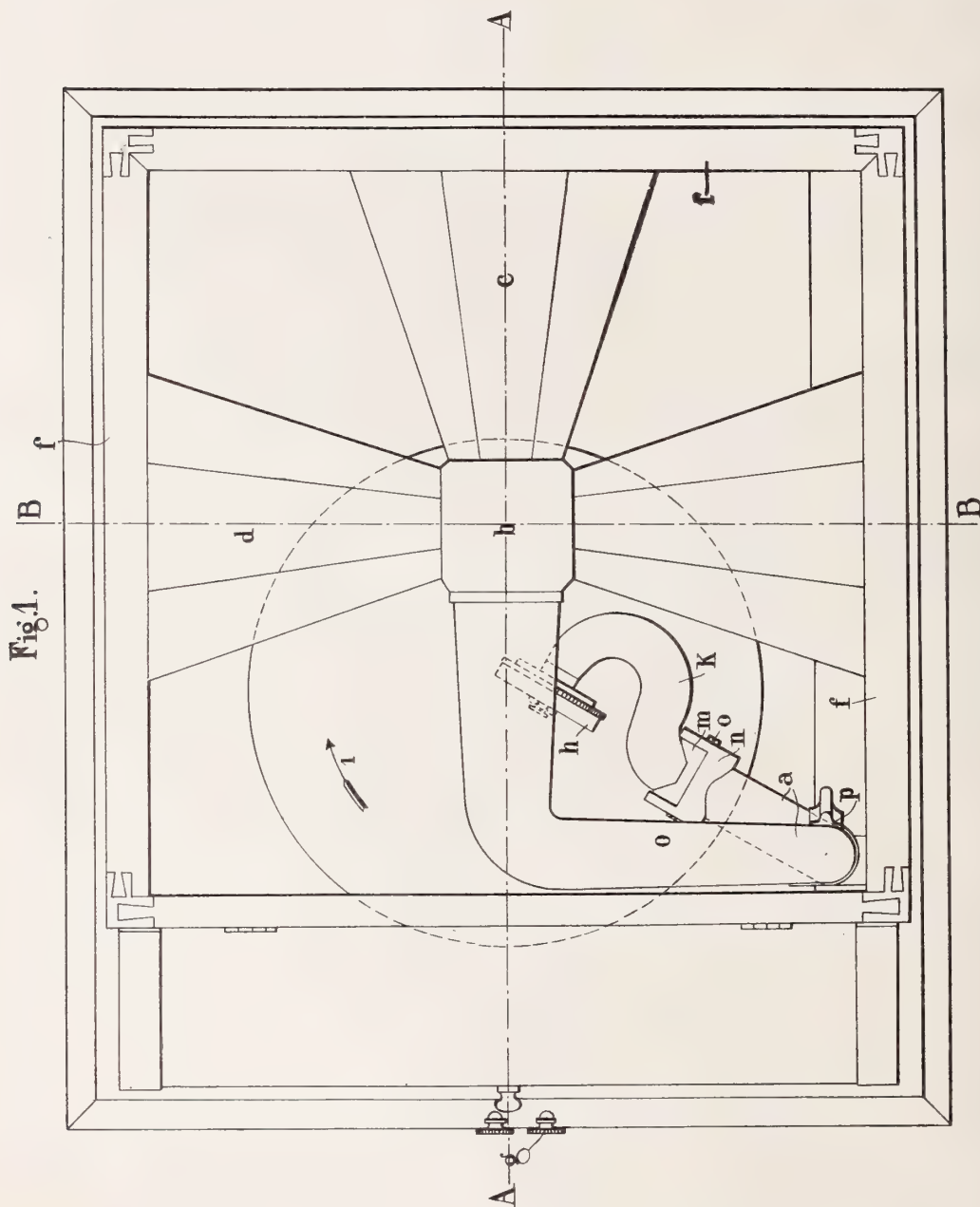






1,013,247.

4 SHEETS—SHEET 1.



Witnesses:

F. R. Fritton.

*J. J. Pinata*

Henry G. Kieder

By Wisconsin, John & Witherspoon

his Atty





H. G. WIEDER.  
SOUND REPRODUCING AND RECORDING INSTRUMENT.  
APPLICATION FILED AUG. 21, 1909.

1,013,247.

Patented Jan. 2, 1912.

4 SHEETS—SHEET 2.

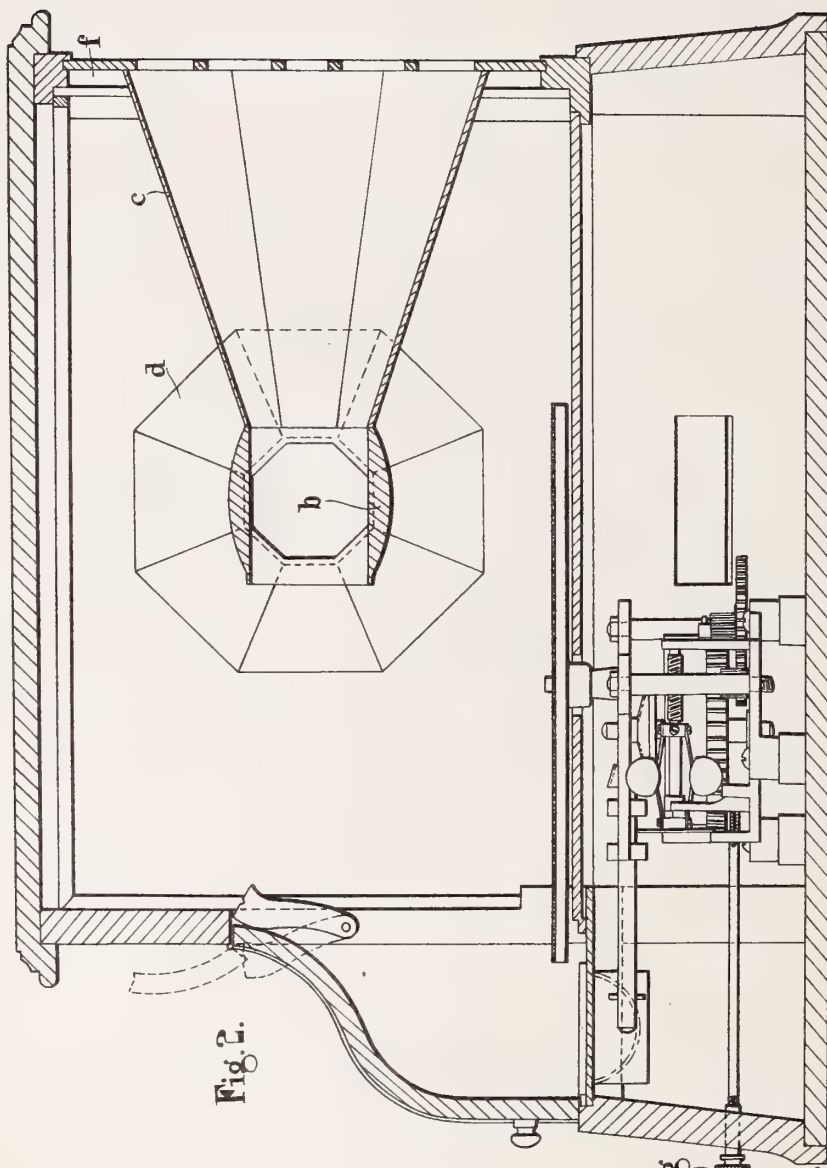


Fig. 2.

*Witness*  
*F. R. Fittler*  
*J. S. Finster*

*Inventor*  
*Henry G. Wieder*  
*By Wilkinson, Jordan & Witherspoon*

*his Atty.*





H. G. WIEDER.  
 SOUND REPRODUCING AND RECORDING INSTRUMENT.  
 APPLICATION FILED AUG. 21, 1909.

1,013,247.

Patented Jan. 2, 1912.

4 SHEETS—SHEET 3.

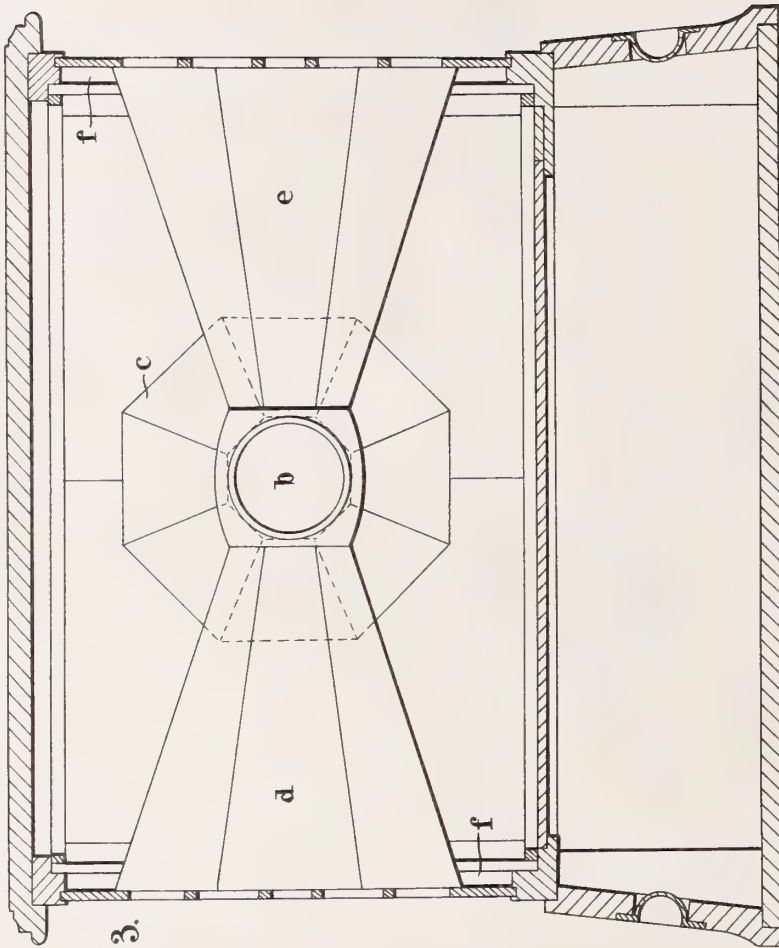


Fig. 3.

Witnesses  
 F. R. Fittton  
 J. S. Minata

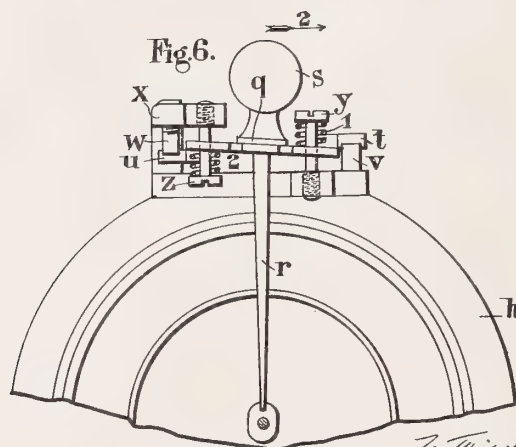
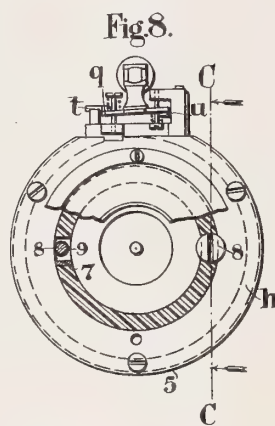
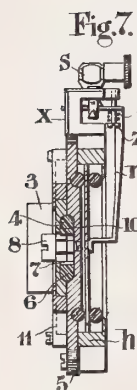
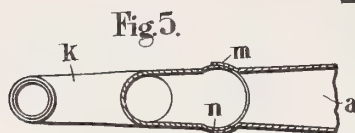
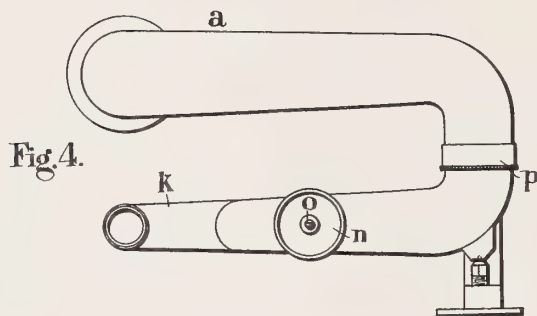
Inventor.  
 Henry G. Wieder  
 by Williamson, Fisher & Witherspoon

his Atty.



1,013,247.

4 SHEETS—SHEET 4



Hitnersee

F. R. Filton

*Spinto*

Inventor  
Henry G. Kieder

By Wilkinson, J. & W. Waterhouse

His Atty.



# UNITED STATES PATENT OFFICE.

HENRY GEORGE WIEDER, OF LONDON, ENGLAND.

SOUND REPRODUCING AND RECORDING INSTRUMENT.

1,013,247.

Specification of Letters Patent.

Patented Jan. 2, 1912.

Application filed August 21, 1909. Serial No. 513,963.

*To all whom it may concern:*

Be it known that I, HENRY GEORGE WIEDER, a subject of the Emperor of Austria-Hungary, of 17 Lanark Mansions, 5 Shepherds Bush, London, in the county of Middlesex, England, scientific mechanician, have invented a new and useful Improvement Relating to Sound Reproducing and Recording Instruments, of which the following is a specification.

This invention relates to improvements in sound reproducing and recording devices such as gramophones, phonographs and the like.

15 One object of the invention is to obtain without a long trumpet the intensification of sound which is usually produced by a long trumpet and at the same time to increase the mellowness of reproduction.

20 Further objects of the invention are to improve the swivel connection of the sound arm which carries the diaphragm, to provide improved support for the carrier of the diaphragm lever and needle and to provide an improved resilient mounting for the element which carries the diaphragm and needle support.

25 The invention consists in providing the instrument with a plurality of short trumpets branching from the sound pipe, said trumpets being provided at or near their ends with sounding boxes, which form walls of an inclosing cabinet. By this arrangement the sounding boxes may be arranged 30 to form a plurality of the sides of a cabinet which incloses the entire instrument including the trumpets and since the trumpets for a given size of instrument are very much shorter than the trumpet usually employed 35 for such an instrument, the overall dimensions of the entire cabinet may be kept small without any parts protruding from the cabinet.

40 The invention further consists in pivotally connecting the portion of the sound pipe which carries the sound box to the rest of the sound pipe in such a manner that the two portions of said sound pipe are coaxial at the joint in their normal working 45 position, and whereby the gradual taper of the sound pipe may be continued to the sound box itself.

According to another part of the invention the needle carrier and diaphragm arm 50 are mounted on a bar having two projecting knife edged arms bearing in suitable

grooves formed one on a pin extending from the sound box, and the other on a pin carried by a bracket attached to said sound box, said knife edges and their corresponding 60 grooves being oppositely turned with respect to each other, and so arranged that the movement of the record against the needle tends to hold the bar more firmly in its bearings.

65 The invention further consists in mounting a diaphragm and needle carrying element upon the end of the sound tube resiliently in such a manner that it may move somewhat relatively to said end in a circumferential direction but may not move out of its normal plane. By this method of mounting the entire movement of the needle in the direction which affects the diaphragm is transmitted to the diaphragm instead of 70 some of the movement being absorbed in moving the diaphragm carrier out of its proper plane as occurs in apparatus of this character at present in use.

75 The invention further consists in an improved diaphragm for sound reproducing and recording instruments consisting of a thin disk of wood, composition or the like with a circular flange or ridge some distance within the periphery, the portion of the 80 diaphragm within this flange or ridge being thickened.

85 The invention also consists in the improved arrangement of sound reproducing instrument and in details of the same as hereinafter indicated.

90 Figure 1 is a plan view showing a gramophone constructed according to the present invention. Fig. 2 is a section on the line A—A of Fig. 1 with sound pipe and diaphragm carrying element removed. Fig. 3 95 is a section on the line B—B of Fig. 1, showing the arrangement of the funnels and sounding boxes. Fig. 4 is an elevation of the sound pipe having a continual taper. 100 Fig. 5 is a partly sectional view of the mechanism shown in Fig. 4, and illustrating my improved swivel joint. Fig. 6 shows an enlarged view of my improved needle mounting. Fig. 7 is an elevation of my improved diaphragm carrying element with 105 part of the back cover removed. Fig. 8 is a sectional view of the parts shown in Fig. 7; Fig. 9 is a section through my improved diaphragm.

110 In carrying this invention into effect according to one construction I lead the end

of the sounding tube, *a* into a small boxing *b*, from which several, say, three, short rapidly diverging funnels or trumpets *c*, *d*, *e*, branch; one, *c*, of these trumpets is preferably arranged to be coaxial with the end of the sound tube, *a*, and the others, *d* and *e*, to be co-axial with one another but at right angles to the first mentioned trumpet *c*. The three trumpets terminate in double walled sounding boxes *f*, which form three of the sides of the cabinet inclosing the entire apparatus. In one way of arranging this, as shown in the drawings, the trumpets pass a close fit through the inner walls of the sounding boxes *f*, and are secured against the outer walls which are provided with openings opposite the trumpets; or in another way of arranging it the trumpet ends may terminate at the inner walls of the sounding boxes, the outer walls of which are provided with suitable openings opposite the mouths of the trumpets. The outer walls of the sounding boxes *f*, are preferably provided with openings to improve the effect of the sounding boxes. Within the cabinet I arrange a reproducing instrument such as a gramophone, phonograph or the like. These trumpets may, however, be arranged at any angle to each other and the sound pipe but in all cases they terminate in sound boxes arranged to form the walls of a cabinet inclosing the apparatus.

It is found that although relatively short trumpets are used, the loss of intensity occasioned by the reduction in the length of the trumpet is compensated by the intensification of the sound occasioned by the sounding boxes *f*, while the arrangement of the plurality of trumpets substantially improved the mellowness of the reproduced sounds. Moreover, on account of the shortness of the trumpets the whole apparatus may be inclosed within a cabinet of very small dimensions from which nothing projects except the controlling push buttons or the like as shown at *g* in Figs. 1 and 2.

In order that the sound pipe *a* may be formed with a continual taper from where it joins the enlargement *b*, to the back plate 5, of the diaphragm carrier *h*, when a portion of it is arranged with a swivel joint I arrange the large end of the diaphragm carrying portion *k* of the sound tube *a*, so that it may be coaxial in the working position with the part of the pipe *a* to which it is pivoted and I arrange the ends so that they make a socket joint. This may be done by forming on the end of the pipe *k* an enlargement *m*, having a cylindrical surface struck from an axis at right angles to the axis of the jointed end of the pipe. This cylindrical portion *m* knuckles into a correspondingly formed interior of another enlargement *n*, formed on the small end of the pipe *a*, having two ends carrying pivot screws *o*,

which enter recesses at each side formed on the axis of the first cylindrical enlargement, *m*. From this socket joint the pipe *k* gradually tapering down may be curved or straight according to the construction of the particular instrument used but for a disk record it is preferably made with a bend as shown in Fig. 1 and in any case is arranged so that when the needle is in operative position upon the record, the axes of the adjacent pieces of the pipe at the joint shall be co-axial instead of at right angles as occurs in usual constructions.

When the device is arranged in a cabinet, an additional joint as shown at *p*, in Figs. 1 and 4, of any convenient construction may be provided in order that the diaphragm carrier *h* may be swung out to a convenient position for adjustment.

According to another part of the invention the bar *q*, or the like, which carries the diaphragm lever *r*, and the needle holder *s*, is provided with two projecting knife edged arms *t* and *u* adapted to bear in grooves on the ends of the pins *v* and *w*. The knife edges *t* and *u* are arranged in opposite directions, the one, *u*, of the side of the carrier *h*, toward which the record moves (the direction of rotation of the record is shown by the arrow 1 in Fig. 1 and by the arrow 2 in Fig. 6) being arranged with its edge toward the record, the pin *w* in which it bears being carried by a bracket *x*, while the other knife edge *t* is arranged in the opposite direction and bears upon the pin *v* projecting upon the diaphragm carrier *h*. The knife edges are preferably held toward their bearings by screws *y*, *z*, with interposed springs. By arranging the knife edges in the above mentioned manner it will be seen that the contact of the needle with the record while the latter is running tends to press the knife edges more firmly upon their bearings instead of tending to lift them against the resistance of springs as occurs in the usual form of instrument. High notes are by this means more satisfactorily reproduced since chattering of the bearings is avoided, and the adverse effect of any scratching which may occur is greatly reduced in that the vibrations caused by scratching are not transmitted to the diaphragm. In place of the coil springs shown plate springs may be used if desired.

In the further part of the invention relating to the resilient mounting of the element which carries the diaphragm upon the member 3, which fixes to the portion *k* of the sound pipe *a*, I form in the latter part a concentric circular groove 4, and in the adjacent face of the back plate 5 of the diaphragm carrying member *h* I form a similar groove 6. Within the groove 4 of the member 3 are two projections 7 which extend into the groove 6 of the adjacent mem-



ber 5. Similar projections but in different positions are formed in the groove 6 of this member 5. These may conveniently take the form of screws 8, which pass through 5 suitable slots in the members 3. These screws are preferably surrounded by a sleeve 9 of resilient material such as rubber. In the grooves 4 and 6 are spring buffers 10 also of some resilient material such as rubber. The projections 7, on the member 3 bear against the one set of ends of the buffers 10 or the like, while the screws 8 on the other member 5 act as buttresses for the other ends of the buffers 10. The two members, 3 and 5, are clamped together face to face by a ring 11, or the like, so that they cannot move toward or away from one another although they may have some small rotary movement relatively to one another against the resistance of the resilient buffers 10. In consequence of this device when the needle is in use a certain amount of yield is afforded to the needle carrying member 5 and this yielding action is exerted in a circumferential direction about an axis passing parallel with the diaphragm 12, although a movement of the needle carrying member 5, in the direction in which the needle tends to move while deflecting the diaphragm 12, is also provided. The back plate 5 is held to this member 4 by screws or the like passing through the rubber washer the holes in the member 5, through which such screws pass being made slightly larger than actually required. By this means relative circumferential movement of the diaphragm carrying element 5 to the member 3 is allowed while a metal to metal contact is also obtained thereby preventing relative movement of these two members in any other direction.

In constructing a diaphragm according to this invention a disk of wood 12 is provided some distance within its periphery

ridge, which prevents warping of the diaphragm by atmospheric changes and the like. The portion of the disk 12, within the ridge or flange 13, is preferably made somewhat thicker than the rest of the diaphragm. It is found that a wooden diaphragm of this character may be used for a long period without warping and the sounds reproduced by it are of an exceedingly mellow tone. Instead of employing wood however for the diaphragm, other non-metallic materials or compositions such as "Gallalith" (which consists of carbon, milk and potato or the like) may be used.

It will be seen that many modifications may be made in the method of carrying this invention into effect without in any way departing from the spirit of the same.

What I claim as my invention and desire to secure by Letters Patent, is:—

In a sound reproducing or recording apparatus, the combination of a casing; said casing having inner and outer walls spaced apart to provide sounding boxes; a needle carrier; a diaphragm; a sound pipe connected at one end with the needle carrier; a boxing disposed centrally of the casing and connected with the other end of said sound pipe; said boxing comprising a plurality of substantially rectangular walls; and a plurality of trumpets of equal length connected with said boxing; said trumpets extending through the inner walls of said sounding boxes and having their outer edges meeting flush with the inner surfaces of the outer walls of said sounding boxes, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

HENRY GEORGE WIEDER.

Witnesses:

ALFRED T. BRATTON,  
E. L. H. ELLIOTT.





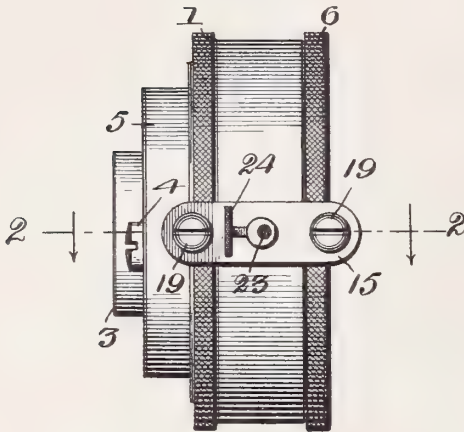


B. L. RINEHART.  
SOUND BOX FOR TALKING MACHINES.  
APPLICATION FILED DEC. 22, 1905.

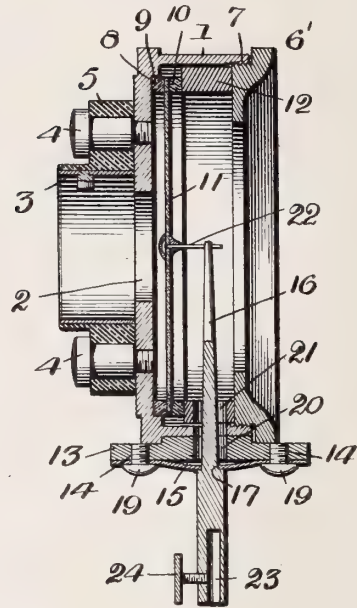
1,013,314.

Patented Jan. 2, 1912.

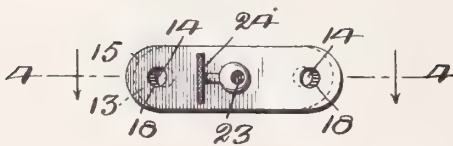
*Fig. 1.*



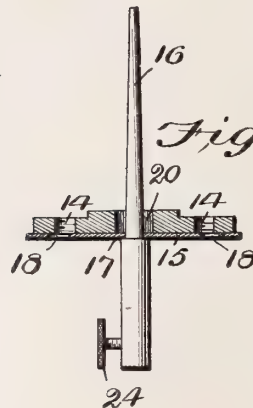
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



WITNESSES:  
*F. L. Barry*  
*Alston B. Moulton*

INVENTOR  
*Bentley L. Rinehart*  
BY  
*James P. Kelly*  
ATTORNEY.

# UNITED STATES PATENT OFFICE.

BENTLEY L. RINEHART, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SOUND-BOX FOR TALKING-MACHINES.

1,013,314.

Specification of Letters Patent.

Patented Jan. 2, 1912.

Application filed December 22, 1905. Serial No. 292,918.

*To all whom it may concern:*

Be it known that I, BENTLEY L. RINEHART, a citizen of the United States, and a resident of the city of Camden, county of Camden, State of New Jersey, have invented certain new and useful Improvements in Sound-Boxes for Talking-Machines, of which the following is a full, clear, and exact description.

10 My invention relates to certain improvements in sound boxes for talking machines and particularly to the yielding support on which the stylus bar is mounted and to the means for adjusting and holding the diaphragm.

15 The object of this invention is to provide a sound box in which the quality and volume of the tone of reproduction is rendered clearer, more distinct and more natural than it has heretofore been possible to do.

20 A further object of my invention is to dispose a simple spring support for a stylus bar in such a manner that the quality of the reproduction is greatly improved.

25 A further object of my invention is to provide a construction in which the diaphragm may be readily adjusted with respect to the stylus bar and, when adjusted, may be held between the elastic gaskets by a pressure which may be varied to secure the best results in the recording or reproducing of sound.

30 Briefly my invention consists in mounting the stylus bar on a flat spring which in turn is secured to a suitable supporting plate, the said spring between its points of support being buckled or slightly sprung away from the supporting plate and having its longitudinal axis perpendicular to the plane of the diaphragm and lying within the plane of the oscillation of the stylus bar.

35 In the accompanying drawings forming a part of this specification, Figure 1 shows a sound box having my improved stylus spring secured thereto; Fig. 2 is a longitudinal section of a sound box containing my invention, taken on the line 2—2 and Figs. 3 and 4 are detail views showing the stylus bar and its support detached from the sound box casing.

40 1 indicates a cylindrical casing of a sound box provided on the back side thereof with an opening 2, connected with the sound tube 3 secured to the back of said sound box by screws 4 passing through the elastic mount-

ing 5 on the outside of said sound tube. Into the front side of the cylindrical casing 1, the face plate 6 is secured by threads 7 within the casing and upon the outside of the body of the face plate. The outer flange 60 of the face plate is provided with a knurled surface 6' in order that the same may be rotated with facility.

8 indicates a seat, within the casing, for one of the elastic gaskets 9 and 10 between which the diaphragm 11 is held. 65

12 indicates a follower or bushing which is adapted to engage the gasket 10 and the inner side of the face plate 6 when the face plate is screwed into the front side of the 70 casing.

On one side of the sound box, is secured, in any suitable manner, a supporting plate 13, provided with threaded holes 14.

15 indicates the supporting spring upon which the stylus bar 16 is mounted, said spring consisting of a comparatively thin and narrow strip of any suitable spring metal provided in the middle and at the ends thereof with holes 17 and 18—18. The distance between the holes 18—18 of the spring, is a little greater than the distance between the holes 14—14 of the support, so that when the spring is secured to the support by screws 19 passing through the holes 18 and into the threaded holes 14, the spring will be buckled or sprung away from the support. The stylus bar is held within the hole 17 of the spring in any suitable manner as by being tightly forced into the same or soldered therein and the inner end of the stylus bar will project through the hole 20, of the casing, and 21, of the bushing or follower, to a position near the center of the diaphragm to which it is adapted to be attached through the connection 22. The outer end of the stylus bar is provided with a socket 23 into which the stylus may be inserted and clamped by the set screw 24. 90

By reason of the above construction I am enabled to apply a greater or lesser pressure to the edges of the diaphragm in order to secure the best results in recording and reproducing sound, by merely rotating the face plate to move the same toward or away from the diaphragm, and to mount the stylus bar on a yielding support in such a manner that the plane of the oscillation of the stylus bar will pass through the axis of the spring, the axis of the spring being also 105 110



perpendicular to the plane of the diaphragm. This relation between the spring and the stylus bar results in a pure and loud reproduction of the sound and affords a simple and effective way of mounting the stylus bar. Moreover, the pressure applied to the edge of the diaphragm may be easily adjusted or varied to suit varying conditions.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States, is:—

1. In a sound box for talking machines, the combination of a stylus bar, a spring support therefor and a spring supporting plate, said spring and said plate having holes near the ends thereof, the distance between the holes in the spring being normally greater than that between the holes in the plate, and means for securing said spring and said plate with the holes in the spring registering with the holes in the plate.

2. In a sound box for talking machines, the combination with a stylus bar, of a spring supporting plate extending parallel with the axis of said sound box, and a recurved spring secured at its ends to said supporting plate and capable of being variably buckled centrally away from its line of support and having its longitudinal axis perpendicular to the plane of the diaphragm for supporting said stylus bar.

3. In a sound box for talking machines, the combination with a diaphragm, of a stylus bar, a buckled spring upon which said bar is mounted, the longitudinal axis of the said spring being perpendicular to the plane of the diaphragm, and a support for said spring, said spring being buckled centrally away from said support and adjustable to vary its tensibility.

4. In a sound box for talking machines the combination with a stylus bar, of a spring supporting plate extending parallel to the axis of the sound box, and a recurved spring secured at its ends to said supporting plate and capable of being variably buckled centrally away from its line of support, and having its longitudinal axis perpendicular to the plane of the diaphragm, for supporting the stylus bar.

5. In a sound box for talking machines, the combination of a stylus bar, a spring

support therefor, a spring supporting plate, said spring being longer than said plate, and means for securing the spring to the plate with their ends in alinement, the said spring being buckled centrally away from the line between the points at which it is secured to said plate, said securing means being adjustable to vary the tensibility of said spring.

6. In a sound box, the combination with a stylus, of a spring support therefor, a spring supporting plate, the ends of said spring support being secured to the plate, and the central portion of said spring support being sprung away from the said plate, and means distinct from said plate arranged to secure said spring thereto.

7. In a sound box, the combination with a stylus bar, of a spring support therefor, a spring supporting plate having a flat surface, the ends of said spring support being secured to the said flat surface, and the central portion of said spring support being sprung away from said plate, and adjustable means arranged to secure said spring to said plate.

8. In a sound box, the combination with a stylus bar, of a spring support therefor extending radially in opposite directions from said bar, a spring supporting plate provided with an aperture, said bar extending through said aperture, the ends of said spring support having apertures registerable with apertures in said plate, when the central portion of said spring support is bowed away from said plate.

9. In a sound box for talking machines, the combination with a stylus bar, of a spring supporting plate extending parallel with the axis of said sound box, a recurved spring secured at its ends to said supporting plate and buckled centrally away from its line of support, and means arranged to secure said spring to said supporting plate, and adjustable to variably buckle said spring with respect to its line of support.

In witness whereof I have hereunto set my hand this nineteenth day of December, A. D., 1905.

BENTLEY L. RINEHART.

Witnesses:

WM. EARLY,

CHAS. K. BENNETT.

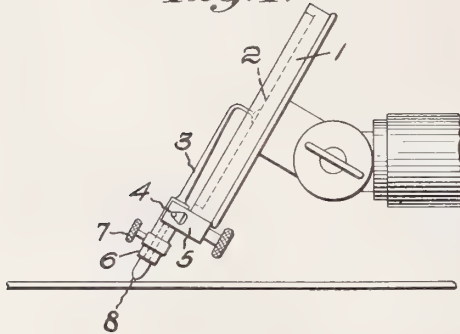


J. B. MILLET.  
PHONOGRAPH.  
APPLICATION FILED MAR. 29, 1911.

1,013,421.

Patented Jan. 2, 1912.

*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



*Witnesses:*

*Horace A. Crossman,*  
*Carl L. Choate.*

*Inventor:*

*Josiah B. Millet.*  
*by Emory Brock Jannay Harry*  
*Attys.*

# UNITED STATES PATENT OFFICE.

JOSIAH B. MILLET, OF BOSTON, MASSACHUSETTS.

## PHONOGRAPH.

1,013,421.

Specification of Letters Patent.

Patented Jan. 2, 1912.

Application filed March 29, 1911. Serial No. 617,561.

*To all whom it may concern:*

Be it known that I, JOSIAH B. MILLET, a citizen of the United States, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Phonographs, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to phonographs, being particularly concerned with the provision of means for improving the quality of the sound reproduced by such instruments.

The invention will be best understood by reference to the following description when taken in connection with the accompanying drawing of one illustrative embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings: Figure 1 is a side elevation of the reproducing mechanism of a phonograph equipped with one form of the invention; Fig. 2 is a detail in enlarged section showing the stylus support; and Fig. 3 is a modified form showing a stylus support suitable for use in connection with records provided with grooves having lateral undulations.

Referring to the drawings and the illustrative embodiment of the invention therein disclosed, I have shown, as conventionally illustrative of the reproducing mechanism of a phonograph, the sound box 1 having the diaphragm 2 (shown in dotted lines), to which is attached one end of the stylus lever 3, the latter being pivoted at 4 upon the lugs 5 secured to the sound box and having at its opposite end the socketed enlargement 6 wherein is secured, by means of the set screw 7, the carrier for the stylus or tracking point or the stylus itself.

The form of stylus and reproducing mechanism shown in Fig. 1 is specifically intended for use with records having grooves provided with vertical undulations, or in other words having an "up and down" cut. The invention, however, as will be more fully referred to, may be used in connection with records having the "zigzag" or other form of cut and may be applied to reproducing mechanisms of varying constructions and types, the one herein shown being selected merely to illustrate the principle of the invention.

In the reproduction of sound, as is well

known, the reproduction of the sound originally recorded ordinarily contains many imperfections, some of which are due to imperfections in the record itself and many of which are due to the action upon the diaphragm of mechanical effects, such, for example, as are caused by extraneous sounds, or by the scratching contact of the stylus against the record material. These imperfections, which occur irrespective of whether the record groove faithfully represents the undulations of the original sound, are converted into air vibrations by the diaphragm as well as those vibrations which are transmitted as faithful reproductions of the sound record undulations and are imposed upon the resultant sound emitted from the instrument in the form of unmusical inharmonic or discordant sounds, detracting materially from the quality and the accuracy of the reproduction.

It has heretofore been attempted to cut down the effect of the scratching and other disturbing noises by muffling more or less all the sound emitted by the instrument or by insulating the reproducing mechanism from the noises created by the motor or other extraneous sounds, but the indiscriminate muffling of all emitted sounds muffles those harmonic or musical sound vibrations which are intended to result directly from, and to reproduce exactly, the undulations of the sound groove, as well as the undesirable or inharmonic sounds, while the insulation of the reproducing mechanism from the motor and other extraneous noises does not eliminate or affect the scratching, hissing and other sounds which, as imperfections in the reproduction, are transmitted to the diaphragm through the stylus and its connections thereto.

It has also been attempted to soften the reproduced sound and exclude the discordant unmusical sounds by employing a stylus of soft sound-absorbent material, such as fiber, in place of the relatively hard, non-absorbent stylus such as the common steel needle. Such absorbent stylus, however, fails to reproduce the true undulations of the record with the clearness and sharpness of a stylus of the non-absorbent type. The apparent action of such an absorbent stylus is to remain inert or non-responsive not only to inharmonic sounds, but also to undulations in the record groove representing desired faint sounds, over-tones, and notes



of high periodicity, the result being that such vibrations, as well as the inharmonic vibrations are excluded or partly excluded from the stylus, stylus lever and diaphragm and the reproduction otherwise lacks the clearness and definition of a reproduction by a non-absorbent stylus.

It has also been attempted to soften the reproduced sound by dampening or cushioning the vibrations of the stylus or of the stylus lever, as for example, by interposing a dampening or cushioning body between the stylus and the lever or between the lever and the diaphragm. Such efforts, however, have failed to accomplish the object sought by the present invention for they fail to transmit accurately the stylus movement and result in retarding the stylus and in dampening or cushioning all vibrations to a greater or less extent and in diminishing the definition or sharpness of the reproduction of musical as well as non-musical sounds.

In carrying out the present invention I utilize a non-absorbent stylus such, for example, as a sapphire ball or point or a steel needle, for traveling in contact with the record thereby to reproduce accurately in the form of stylus movements each and every undulation contained in the record. I also utilize a connector, preferably in the form of a stylus lever, intermediate the said stylus and the diaphragm which is of such shape, mass and material as to transmit to the diaphragm faithfully and without any substantial loss by absorption, the movements communicated to it. Intermediate such non-absorbent connector, however, and the non-absorbent stylus I cause to be interposed a relatively absorbent body of such vibration absorbing material and of such shape and mass as is adapted to absorb locally within itself objectionable and inharmonic stylus vibrations but which, however, is distinguished from a mere cushioning or dampening body, and constitutes a movement-transmitting mass transmitting with substantial accuracy the desired, harmonic movements of the stylus to the stylus lever or connector. Preferably I employ a block of absorbing material at the tip of end of the stylus lever and serving preferably as a seat or holder for the stylus itself. The result is that while the stylus is free to move in response to all the undulations of the sound record, those vibrations which would otherwise become manifest through the vibrations of the diaphragm as unmusical sounds and sounds of low pitch, such as those resulting from hissing, scratching, bursts and other defects, are locally absorbed by the stylus carrier at the end of the stylus lever, while the desired vibrations of periodicity which manifest themselves as musical or harmonic notes are transmitted to

the diaphragm with definition and distinctness, resulting in greatly improved quality of reproduction without any materially lessened sharpness.

Referring to Figs. 1 and 2, the non-absorbent stylus which therein is represented as a hard sapphire point, is shown as secured in any suitable way, as for example, by a setting of shellac in the tip of a carrier 9, the shank of which is reduced so that it can be fitted into the socket 6 of the stylus lever as is usual with the ordinary sapphire carrying pin. The stylus carrier 9 is made of any suitable sound absorbent material such as ordinary commercial fiber or wood, either of which, if properly shaped and proportioned, as for example fiber of the shape and proportions shown, having a tapered lower end and a substantial body with an ample seating shoulder, will absorb very largely the non-musical movements or vibrations of the stylus 8, yet in connection with the stylus lever will produce the desired movement of said lever. It will be seen that the absorbent stylus carrier is of large mass relatively to the stylus and small mass relatively to the lever 3.

The fiber 9 shown in Figs. 1 and 2 constitutes a movement-transmitting mass between the stylus and the lever since it is of such proportions and material as to transmit accurately the harmonic movements of the stylus to the lever. The stylus lever may be of metal, but whether of metal or other material, it should be of such proportions and material as to be relatively non-absorbent of the harmonic vibrations thus received. It will thus be seen that while the sapphire point is separated from the metal of the stylus point 3 by the interposed body of absorbent fiber so that all desired movements passing from the stylus point to the diaphragm are transmitted through the body of fiber, the latter has no material effect on the rigidity of the connections between the stylus and the diaphragm, but a structurally stiff or unyielding connection is afforded so that the diaphragm vibrates in response to the vibrations of the stylus, and the latter, on the other hand, may move freely and without retardation in response to the undulations of the record groove. The same principle may be applied to a stylus in the form of the ordinary needle point used in connection with records having the zigzag cut and in Fig. 3 I have shown a similar fiber holder 10 having a socket to receive the needle point 11.

Other absorbent materials than those specified may be utilized, it being found generally that the more soft and porous the material employed, the greater the obstructive or absorbent effect, the effect of such materials being to absorb the discordant sounds to a much greater extent than the

harmonic sounds. For ordinary purposes it will be found that hard fiber properly proportioned, as for example as shown in the drawings, is satisfactory for this purpose.

It is preferable to employ the absorbent material as a holder or seat for the stylus point itself, the effect being best when the stylus carrier or preferably the stylus itself, is gripped by or seated in the fibrous or other material used and the effect being also best when the mass of the absorbent material is relatively large as regards the mass of the stylus and relatively small as regards the mass of the stylus lever.

While for illustrative purposes I have shown and described one specific form of the invention, it is to be understood that it is not limited to the particular application made herein of the same or to details, form, material or construction of the parts herein illustrated.

I claim—

1. In a phonograph reproducing mechanism, the combination with a non-absorbent stylus, of a stylus-carrying head comprising a block of sound-absorbent material and of relatively large transmitting mass as compared with said stylus, and a non-absorbent stylus bar, said head being seated against said bar to transmit thereto substantially all the unabsorbed record-producing sound-reproducing movements of said stylus.

2. In a phonograph reproducing mechanism, the combination with a non-absorbent stylus of a stylus-carrying head comprising a block of fibrous material of relatively large transmitting mass as compared with the stylus, and a metallic stylus bar, said head being seated against the stylus bar to transmit thereto the vibrations of the stylus.

3. In a phonograph reproducing mechanism, the combination with a non-absorbent stylus of a stylus-carrying head comprising a block of sound absorbent material of relatively large transmitting mass as compared with the stylus, said head having a tapered end in which the stylus is seated, and a non-absorbent stylus bar, there being provided a shouldered connection between the head and the bar whereby said head is seated against said bar to transmit thereto vibrations of the stylus.

4. In a phonograph reproducing mechanism, the combination with a non-absorbent stylus, of a stylus-carrying head comprising a block of sound-absorbent material of relatively large transmitting mass as compared with the stylus, said head having a tapered end in which the stylus is seated and a non-absorbent stylus bar, said head having a shank and said bar having a socket to receive the shank whereby the head is connected to the bar to transmit thereto the vibrations of the stylus.

5. In a phonograph reproducing mechanism the combination with a non-absorbent stylus of a stylus-carrying head comprising a block of sound absorbent material of relatively large transmitting mass as compared with said stylus, a diaphragm, and a non-absorbent connection between the block and the diaphragm to transmit thereto substantially all the unabsorbed record-produced sound-reproducing movements of said stylus.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JOSHIAH B. MILLET.

Witnesses:

THOMAS B. BOOTH,

ROBERT H. KAMMLER.





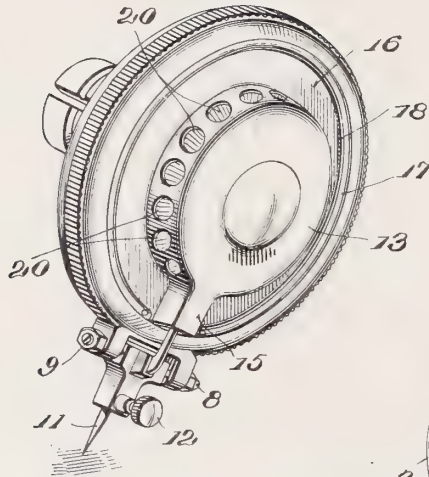


T. H. MACDONALD.  
SOUND BOX FOR TALKING MACHINES.  
APPLICATION FILED MAY 10, 1911.

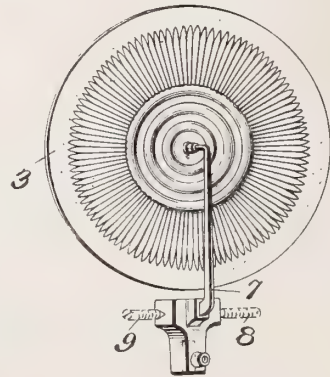
1,014,240.

Patented Jan. 9, 1912.

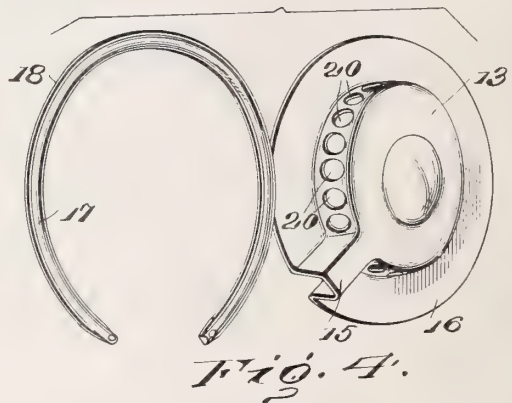
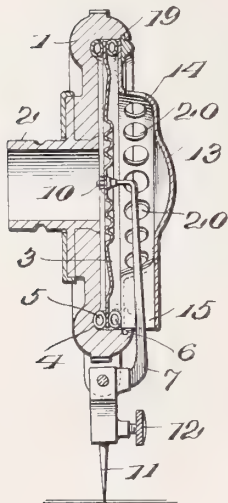
*Fig. 1.*



*Fig. 3.*



*Fig. 2.*



Inventor

*Thomas H. Macdonald*

Witnesses

*R. C. Fitzhugh*  
*E. E. Warfield*

By

*Shaw, Cameron & Co.*

Attorneys

# UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO AMERICAN GRAPHOPHONE COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF WEST VIRGINIA.

SOUND-BOX FOR TALKING-MACHINES.

1,014,240.

Specification of Letters Patent.

Patented Jan. 9, 1912.

Application filed May 10, 1911. Serial No. 626,257.

*To all whom it may concern:*

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented a new and useful Improvement in  
5 Sound-Boxes for Talking-Machines, which invention is fully set forth in the following specification.

This invention relates to sound-boxes for talking machines, and has more particular  
10 reference to the means provided for protecting the diaphragms of such sound-boxes from injury. It has heretofore been proposed to provide a cover for the exposed side of the diaphragm in such sound-boxes,  
15 which cover was arranged to slip over the exterior portion of the sound-box frame, or was provided with means for securing such cover in position on the frame independent of the means for securing the diaphragm in  
20 position in the frame. It has been deemed desirable to have openings through the said cover, and as heretofore constructed, these openings have been such that any sharp-pointed instrument projecting through the  
25 openings could extend in a right line into contact with and injure the diaphragm.

The present invention has for its object to provide a sound-box for talking machines, having a diaphragm and cover, both of  
30 which are secured in position by the same means, and which cover is provided with openings which are so arranged in the cover that any sharp-pointed instrument or other projection entering through the openings  
35 cannot come in contact with or injure the diaphragm.

With this object in view, the invention consists in a suitable sound-box frame having a diaphragm retained between two suitable gaskets, preferably of rubber, a sound-box cover resting upon the outer gasket, and an elastic expansion ring for retaining the parts in position by the engagement of the ring with an undercut groove formed in the  
40 inner wall of the sound-box chamber.

The invention will be best understood by reference to the accompanying drawings, in which—

Figure 1 is a perspective view of a sound-box with the cover in position; Fig. 2 is a vertical central section through such box; Fig. 3 is a plan view of the diaphragm, with the stylus-bar in position thereon; and Fig. 4 shows the cover and the ring for retaining  
55 the parts in their assembled position.

Referring to the drawings, in which like reference numerals indicate like parts, 1 indicates the sound-box frame, having a central hub 2 projecting therefrom, and 3 indicates the diaphragm, which may be of any  
60 suitable construction and material, such as a metallic diaphragm made, for example, of aluminum. Seated within a suitable annular groove 4 in the sound-box chamber is an annular gasket 5, of rubber or other suitable  
65 material, upon which the diaphragm 3 rests. Above the diaphragm 3 is a second annular gasket 6, the parts being so arranged that the periphery of the diaphragm 3 is held between two annular gaskets 5 and 6.

7 is the stylus-bar, suitably supported on the frame of the sound-box by pivot-points 8 and 9, preferably in the form of screws, the stylus bar being secured to the center of the diaphragm in the usual or any suitable  
75 way, as at 10, and 11 is the stylus proper, secured in a suitable socket in the stylus bar by a set screw 12.

The cover 13 is here shown in the form of a metal plate struck up so as to present  
80 substantially vertical walls 14, with a neck or opening 15, through which opening the stylus bar 7 extends, as clearly shown in Figs. 1 and 2. This cover 13 has its flat annular periphery 16 resting upon the outer  
85 gasket 6, and an elastic split ring 17 is provided, having an exterior flange 18, while in the walls of the sound-box chamber there is formed a groove 19, for the reception of the flange 18 on the ring. The split ring is  
90 placed in position upon the top of the periphery of the cover 13, and the ring being slightly collapsed, the whole is pressed down against the rubber gaskets until the flange  
95 18 on the ring comes opposite the groove 19 in the chamber of the sound-box, when, by permitting the ring to expand radially, the flange 18 enters the groove 19, and all of the parts, viz., the diaphragm, the two  
100 gaskets and the cover, are thus securely retained in position by a single retaining means, to wit, the split ring 17.

In the vertical struck-up walls 14 of the cover 13 are provided suitable openings 20, and as these openings lie in a plane substantially perpendicular to the surface of the diaphragm, it will be readily understood that any sharp instrument or other device entering the openings will not impinge upon and injure the diaphragm, thus avoiding the  
110

difficulty heretofore experienced when the openings have been in a plane of the cover parallel with the surface of the diaphragm. Moreover, the stylus-bar is itself protected

- 5 throughout a greater portion of its extent from injury by being struck by any exterior object which would tend to either injure the stylus-bar itself or the diaphragm or its connection to such diaphragm.
- 10 It will be observed that I have thus provided a sound-box with an efficient cover or protector for the diaphragm and the stylus-bar, which is held in position by the same retaining means that holds the dia-
- 15 phragm and gaskets in position, thus cheapening and simplifying the construction, and I have, at the same time, provided suitable openings for the air or sound-waves in the sound-box, which openings, however, will
- 20 not permit of injury to the diaphragm by anything projecting through such openings.

Having thus described the invention, what is claimed is:—

1. In a sound-box for talking machines, a  
25 sound-box frame having a diaphragm-re-

ceiving chamber, a diaphragm in said chamber, two gaskets in said chamber, one on each side of the periphery of the diaphragm, a cover resting upon the outer gasket, and an elastic retaining ring resting upon the 30 periphery of said cover and having a flange entering an annular groove in the said diaphragm chamber, whereby all the parts are secured in position by said ring.

2. In a sound-box for talking machines, 35 a sound-box frame provided with a diaphragm chamber, a diaphragm in said chamber, a cover over said diaphragm, which cover is provided with a wall or portion extending substantially at right angles to 40 the surface of the diaphragm, and having openings or perforations formed in said wall or portion.

In testimony whereof I have signed this specification in the presence of two sub- 45 scribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

ANNA R. DRAPER,  
ELSIE E. CARTMEL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

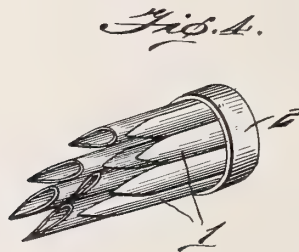
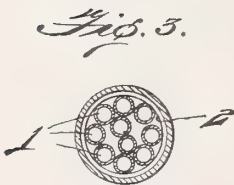
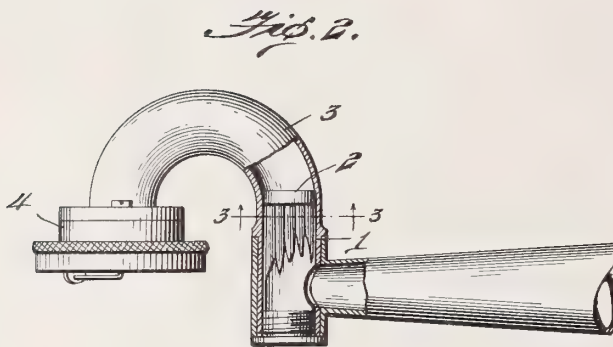
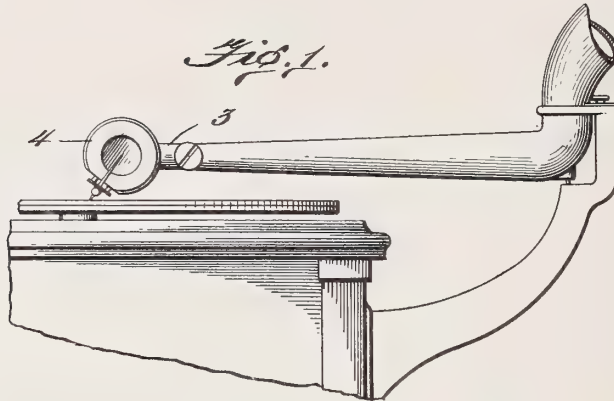




F. VAN V. MORSE.  
TONE CLARIFIER FOR TALKING MACHINES.  
APPLICATION FILED JULY 28, 1910.

1,014,841.

Patented Jan. 16, 1912.



Inventor

*F. V. V. Morse*

Witnesses

*Wm. Offutt*  
*O. B. Hopkins*

by

*A. B. Wilson & Co.*  
Attorneys

# UNITED STATES PATENT OFFICE.

FRANK VAN VLECK MORSE, OF MINNEAPOLIS, MINNESOTA.

TONE-CLARIFIER FOR TALKING-MACHINES.

1,014,841.

Specification of Letters Patent.

Patented Jan. 16, 1912.

Application filed July 28, 1910. Serial No. 574,319.

*To all whom it may concern:*

Be it known that I, FRANK VAN VLECK MORSE, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Tone-Clarifiers for Talking-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improved means for clarifying and improving the tone of talking machines and other sound producers or reproducers.

The general object of the invention is to provide a device of this character whereby the volume of sound will be increased, the tone clarified and the enunciation made more distinct and natural.

Another object of the invention is to provide a clarifier of this character which will be simple, and inexpensive in construction and efficient in operation, and which may be quickly and easily engaged with and removed from its operative position.

With these and other objects in view, the invention consists of certain novel features of construction and combination and arrangement of parts which will be more fully described and afterward specifically claimed.

In the accompanying drawings in which I have illustrated my invention in connection with a talking machine: Figure 1 is a side view of a portion of a graphophone having my invention applied thereto; Fig. 2 is an enlarged side view partly in section of the reproducer, and the tone arm with the invention arranged therein; Fig. 3 is a cross sectional view on the line 3—3 of Fig. 2; Fig. 4 is a detail perspective view of the clarifier.

In carrying out my present invention, I employ a plurality of small tubes 1 which are formed of suitable material, such as straws, or pressed paper from which artificial straws are made, any desired number of tubes being employed, such tubes decreasing successively in length. The tubes are cut squarely across at one end and these squared ends are arranged in the same diametrical plane and the opposite ends of the tubes are beveled off or cut diagonally, as

shown most clearly in Figs. 2 and 3. The tubes are nested and secured together by a circular band 2, which should be of very thin material and with the tubes in the band in parallel relation, they and the band are firmly secured by means of glue or shellac.

While the device may be applied to any form of sound producing or reproducing machine, in the present instance, I have illustrated it as applied to the tone arm 3 leading from the reproducer 4 of a talking machine.

In applying the attachment to this machine, the nested tubes are placed in the tone arm 3 between the reproducer and the amplifying horn, with the squared ends of the tubes arranged toward the reproducer or sound box, and the tapered ends of the tubes disposed adjacent the smaller end of the horn, with the ends of the tubes approximately filling the tone arm at this point.

Largely extended practical use of this device has demonstrated that it magnifies the sound and makes the tones clearer and more distinct, bringing out very clearly sounds which were before practically indistinguishable.

While I have specifically described the construction and arrangement of the component parts of the device, and the position in which it is to be placed, it will be evident to those skilled in the art that changes and variations therein may be made without departing from the spirit and scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new is:

1. A tone clarifier for a talking machine comprising a plurality of nested tubes of varying lengths adapted to be inserted in the tone arm of the machine.

2. A tone clarifier for a talking machine comprising a plurality of nested tubes of varying lengths adapted to be inserted in the tone arm of the machine, the ends of the tubes at one end of the clarifier being cut off diagonally.

3. A tone clarifier for a talking machine comprising a plurality of nested tubes of varying lengths adapted to be inserted in the tone arm of the machine, the ends of the tubes at one end of the clarifier being cut off squarely in the same plane, and those at the opposite end being cut off diagonally.

4. A tone clarifier for a talking machine  
comprising a plurality of nested tubes of  
varying lengths and a circular band of very  
thin material arranged around said nested  
5 tubes, the whole being firmly united by a  
suitable adhesive substance and adapted to  
be inserted in the tone arm of the machine.

In testimony whereof I have hereunto set  
my hand in presence of two subscribing wit-  
nesses.

FRANK VAN VLECK MORSE.

Witnesses:

H. J. JOHNSON,

H. R. FELLOWS.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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E. R. JOHNSON.  
SOUND CONVEYING DEVICE FOR TALKING MACHINES.  
APPLICATION FILED DEC. 24, 1903.

1,015,321.

Patented Jan. 23, 1912.

Fig 2

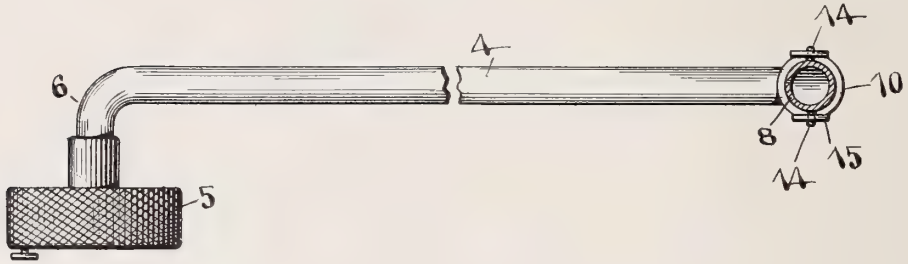


Fig 1

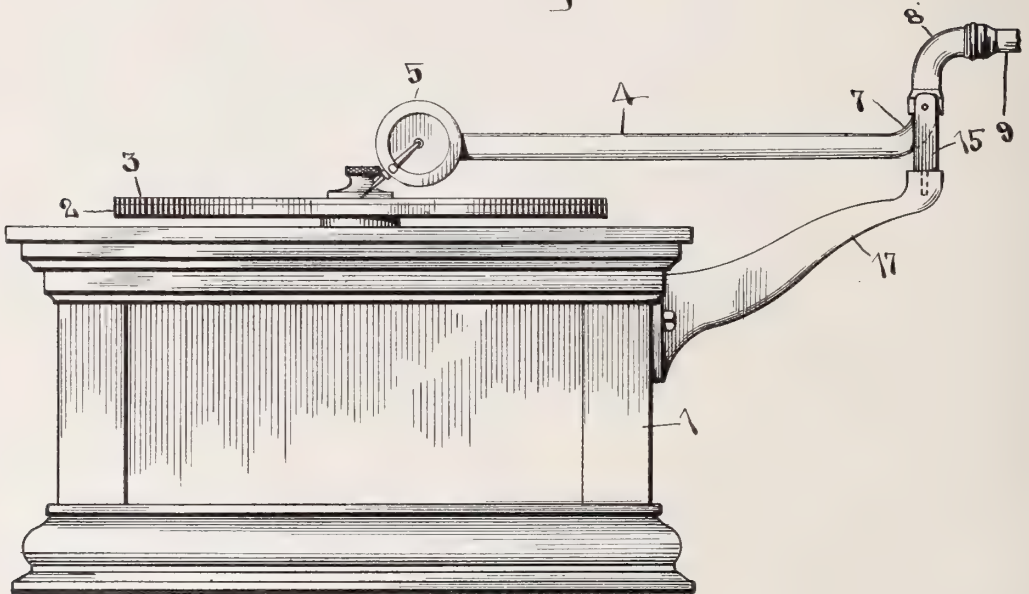
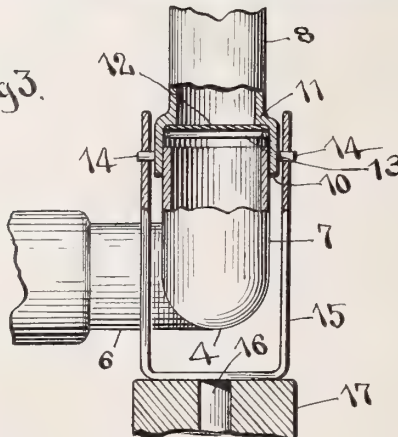


Fig 3



WITNESSES:

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*Edw. W. Vaile Jr.*

INVENTOR  
*Eldridge R. Johnson.*

BY

*James C. Little*  
ATTORNEY.

# UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

## SOUND-CONVEYING DEVICE FOR TALKING-MACHINES.

1,015,321.

Specification of Letters Patent.

Patented Jan. 23, 1912.

Application filed December 24, 1903. Serial No. 186,482.

*To all whom it may concern.*

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Sound-Conveying Devices for Talking-Machines, of which the following is a full, clear, and complete disclosure.

The object of my invention is to provide such a construction in connection with sound tubes of talking machines that the sounds produced may be modified and purified, thereby particularly adapting said machines for the reproduction of speech and conversation, and is particularly adapted to those machines where the sound tubes are placed directly in or at the ear of the person listening to the sounds produced by said machine.

The sound produced by the disk type of talking machine is of such a volume and character when conveyed directly to the ear through the usual ear tube that it is necessary to reduce the volume and purify the tone to prevent the annoying and undesirable vibrations from being objectionable. This is accomplished by providing means for selecting the desirable and useful vibrations required, and allowing only such to be conveyed to the ear. In this instance the means comprise a damper or what may be called an "acoustic filter" which is inserted at a suitable point in the sound conveying means such point being preferably that at which the hollow sound box carrying arm is pivoted to its support. Machines having this feature of construction are particularly adapted for the reproduction of conversation or speech which is required in teaching foreign languages by means of records having distinct lessons in such language or languages recorded thereon. In the latter use of talking machines it is essential and necessary that the articulation and pronunciation be very clearly reproduced without regard to the volume, although it is of course, required to have the volume or intensity of the words reproduced sufficiently great to be easily heard. This result, the present invention accomplishes in a most successful and efficient manner.

For a full, clear and exact description of one embodiment of my invention reference

may be had to the following specification and to the accompanying drawing forming a part thereof, in which—

Figure 1 represents a side elevation of a talking machine having my improvements applied thereto; Fig. 2 a plan view partly in section of the hollow sound arm and its supporting pivot or trunnion; and Fig. 3 an enlarged elevation, partly in section, of the sound tube at its point of support, and showing my improved damper or acoustic filter in position therein.

Referring to the drawing 1 indicates the usual motor casing having rotatively mounted thereon the turntable 2, which carries the sound record 3. Mounted above said turntable and record is a hollow arm 4 carrying the usual sound box 5 which in connection with the record reproduces the sound. The hollow arm 4 has a bend 6 at its outer end with which the sound box 5 is connected so that the diaphragm is practically in a plane parallel with the said tube. The other end of said tube has an upward bend or curved portion 7 which extends practically vertically at right angles to the main portion 4 and is telescopically connected with an outwardly curved elbow 8. The parts of the telescopic joint between the sections 7 and 8 are held in engagement in any suitable or well known manner, such as by having a tight fit which holds the parts in engagement frictionally or by providing the parts with screw threads. To this part of the tube 8 the usual flexible sound conveying tube 9 may be connected. This tube 9 is preferably made of rubber and has at its end the well known ear pieces for entering or contacting with the ear. The telescopic portion of the tube 8 which connects with the portion 7 is formed by enlarging the end of said tube 8 as indicated at 10 so that its internal diameter is substantially the same as the external diameter of the part 7 of the tube 4. This enlargement 10 forms a slight shoulder 11 which acts in the nature of a flange or seat against which a diaphragm 12 may rest and be held in position. The diaphragm 12 is preferably made of elastic, flexible material, such as soft rubber and is held in position against said shoulder 11 by means of a flexible ring 13 of metal or other suitable material. The enlarged portion 10 is provided with horizontal pivots or trunnions 14 which enter



a U-shaped support 15 which is pivoted to turn on a vertical axis by means of the projecting pin or stud 16. This pin or stud 16 enters a recess in the usual fixed supporting arm 17.

It will be seen by the construction last described that the tube 4 is so mounted as to allow a vertical and horizontal movement thereof in relation to the sound record and also that the means for forming the horizontal pivot thereof serves as a means for enabling the diaphragm 12 to be securely held in position.

The operation of the talking machine with my improvement applied thereto is substantially the same as that where the amplifying horn is used, the records being removed and placed in position and the sound box being manipulated in the same way. The sound, however, in passing through the hollow conducting tube which supports the sound box is not amplified, but proceeds with substantially uniform wave fronts until it reaches the diaphragm 12. At this point the coarser and harsher vibrations which serve only to produce a greater volume of sound without increasing the distinctness of articulation are softened or eliminated so that those vibrations which are useful in producing clear enunciation are allowed to pass onward in such a degree as to be clearly audible. In other words, the diaphragm 12 acts in the nature of an acoustic filter which reduces or eliminates the coarser undesirable vibrations but allows the finer and useful vibrations to pass therethrough, thus purifying and preserving the quality of tone, making the sound a very close approximation to the human voice as it is heard without the intervention of a machine or other apparatus.

As before stated this invention particularly adapts the disk form of talking machine, or any other form of talking machine to a use in which foreign languages are taught by lessons made up of words carried on the records. Many of the foreign languages include guttural and harsh sounds which would be undesirably and annoyingly accentuated by using the ordinary form of talking machine without the acoustic filter, but by employing an acoustic filter these sounds are reduced and given their proper intensity in relation to the other vibrations representing the words or syllables.

This invention is not limited to a use with the disk form of talking machine but may also be applied to the cylindrical form having the wax or other record and said acoustic filter or damper may also be used in connection with the amplifying horn if an occasion should arise where several persons desire to listen to the same record without the use of flexible ear tubes. In this instance the diaphragm would simply be

placed in the hollow sound conducting tube which carries the sound box or in the amplifying horn at any desirable point by means of a flange and split ring or other suitable means.

I do not wish to be limited to the exact form, details and arrangement of parts herein shown, for my invention may be embodied in any form commensurate with the claims hereinafter made.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States, is:

1. In a talking machine, the combination of a conducting tube carrying a sound reproducer and having a telescoped joint forming a shoulder therein, an imperforate elastic diaphragm intermediate of the ends of said tube, and means for holding said diaphragm seated upon said shoulder.

2. In a talking machine, the combination with a sound producer, of a sound conducting tube therefor having a telescopic joint forming a shoulder therein, an elastic pliant diaphragm arranged to divide said tube into opposed chambers, and a ring for removably holding said diaphragm seated upon said shoulder within said tube.

3. In a talking machine, the combination of a sound reproducer, a swinging arm connected therewith, a sound conveying tube, said tube having an enlarged portion telescoping with said arm, and forming a shoulder therein, an elastic diaphragm seated against said shoulder, a flexible ring for holding said diaphragm in position, and means for pivotally supporting said arm where the tube joins said arm.

4. In a talking machine, the combination of a sound reproducer, a swinging arm carrying said reproducer, a pivotal support for said arm, a sound conveying tube, a telescoping connection between said arm and tube forming a chamber at the point of said pivotal support, an elastic diaphragm seated in said chamber, and means for securing said diaphragm in said chamber.

5. In a talking machine, the combination with a sound reproducer of a sound conducting tube, and means located in said tube to prevent the harsher vibrations or sounds from passing beyond a predetermined point in said tube, said means comprising an elastic pliant imperforate diaphragm located in said tube at said point.

6. In a sound recording and reproducing apparatus, the combination with a sound box, having a diaphragm therein, and a hollow tubular sound-conveying arm connected therewith, of an imperforate, elastic, pliant diaphragm mounted within said arm.

7. In a talking machine, the combination of a sound reproducer, a sound conducting tube having a telescopic joint therein forming a shoulder, a diaphragm seated against

said shoulder, and a flexible ring for holding said diaphragm seated upon said shoulder.

8. In a talking machine, the combination of a sound reproducer, a sound conducting  
5 tube having an interior circumferential shoulder, a diaphragm seated against said shoulder, and flexible means for holding said diaphragm in position.

9. In a talking machine, the combination  
10 of a sound reproducer, a sound conducting tube provided with a joint therein having an interior shoulder and a diaphragm disposed intermediate of the ends of said tube, and arranged to be held in position between  
15 the parts of said joint against said shoulder, and arranged to transform the sound waves received in one part of said tube and direct said transformed waves through the other part of said tube.

10. In a talking machine, the combination 20 with means arranged to support a sound record, of a sound reproducer having a diaphragm, a sound arm connected with said reproducer, a sound conveying tube tele- 25 scopically connected with said arm, at the end opposite said reproducer, and an elastic imperforate diaphragm extending across said tube at said connection remote from the diaphragm in said reproducer and forming  
an inclosed chamber therewith and an op- 30 posed open chamber in said tube.

In witness whereof I have hereunto set my hand this 21st day of December, A. D., 1903.

ELDRIDGE R. JOHNSON.

Witnesses:

FREDK. C. EBERHARDT,  
CHAS. K. BENNETT.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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E. R. JOHNSON & J. C. ENGLISH.

TALKING MACHINE.

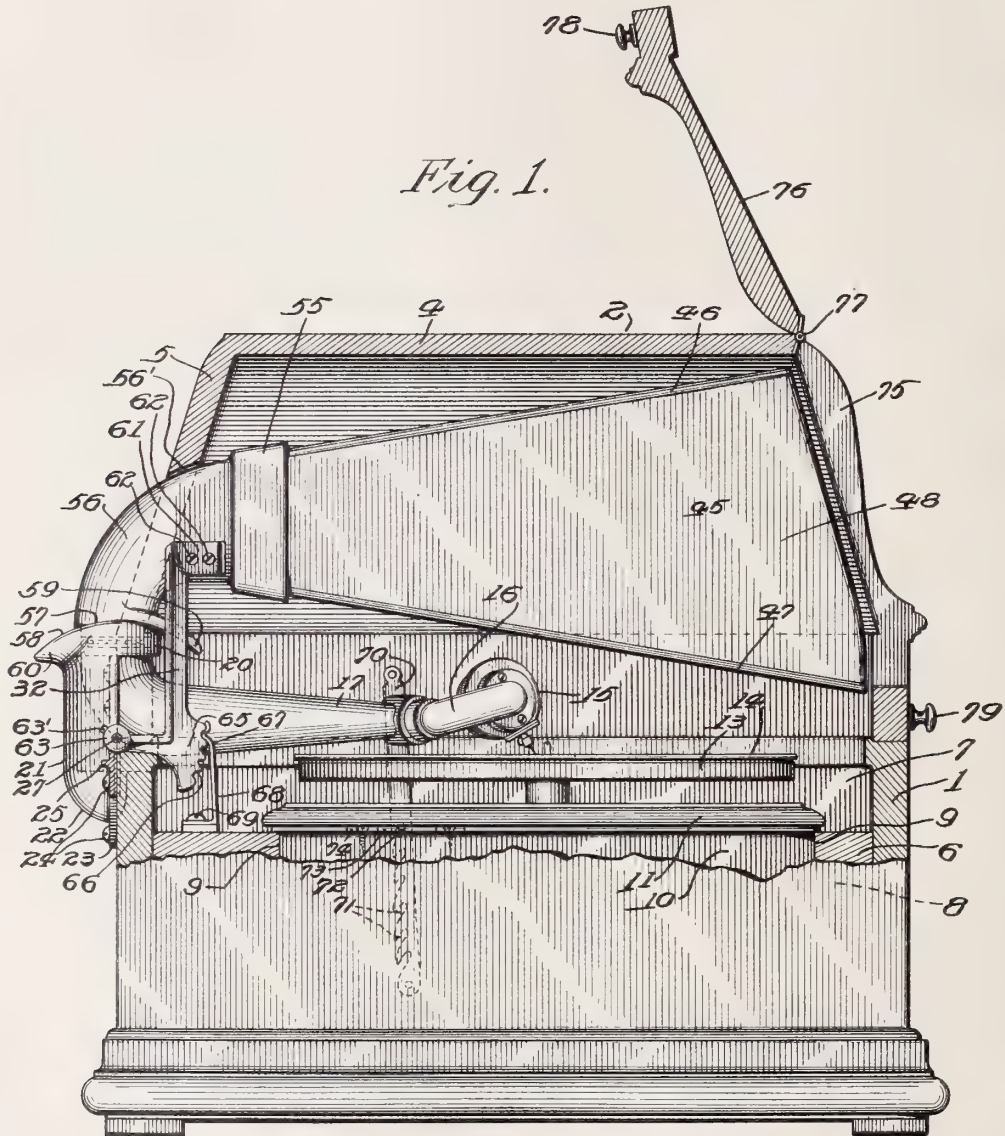
APPLICATION FILED JULY 10, 1909.

1,015,322.

Patented Jan. 23, 1912.

4 SHEETS—SHEET 1.

Fig. 1.



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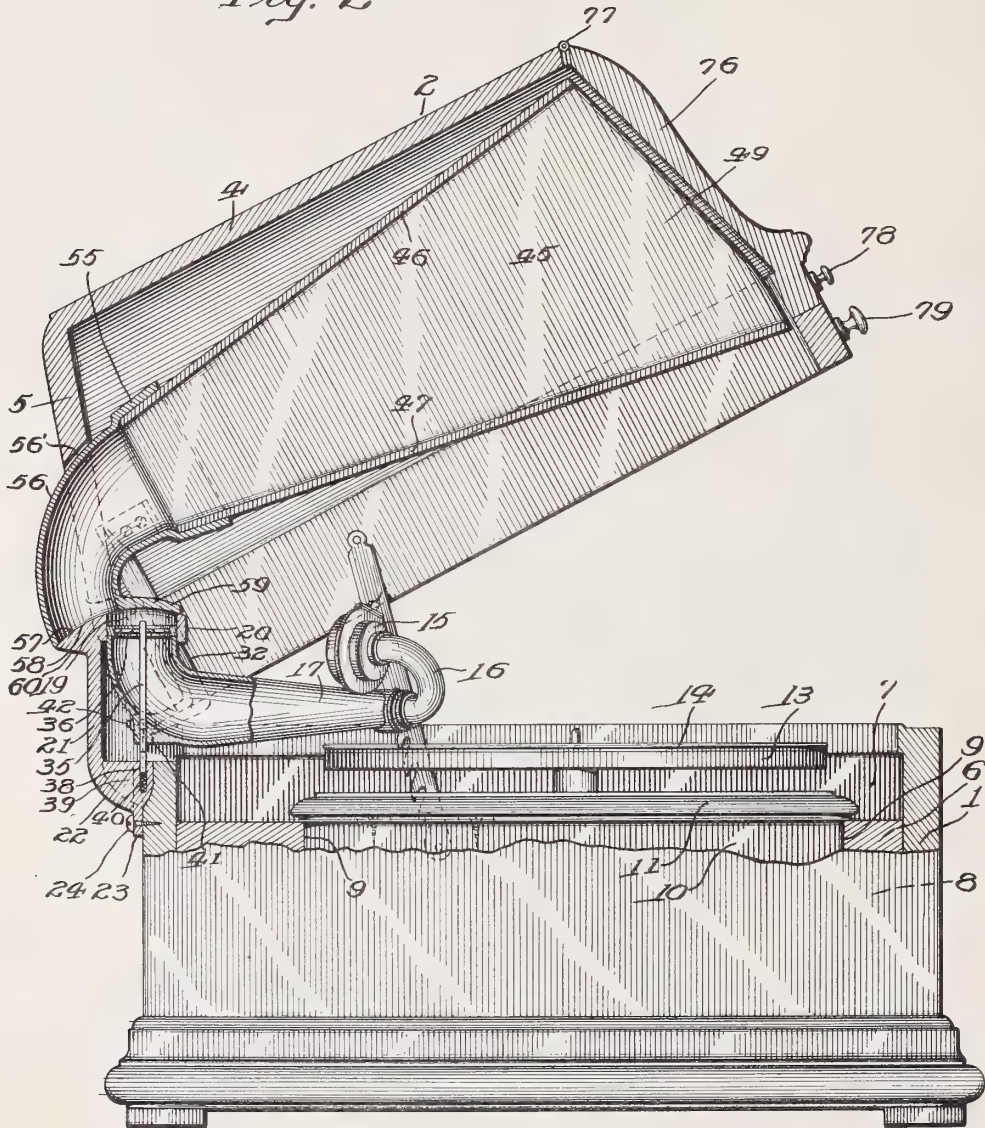


E. R. JOHNSON & J. C. ENGLISH.  
TALKING MACHINE.  
APPLICATION FILED JULY 10, 1909.

1,015,322.

Patented Jan. 23, 1912.  
4 SHEETS—SHEET 2.

Fig. 2



WITNESSES

*W. J. Hartman.*

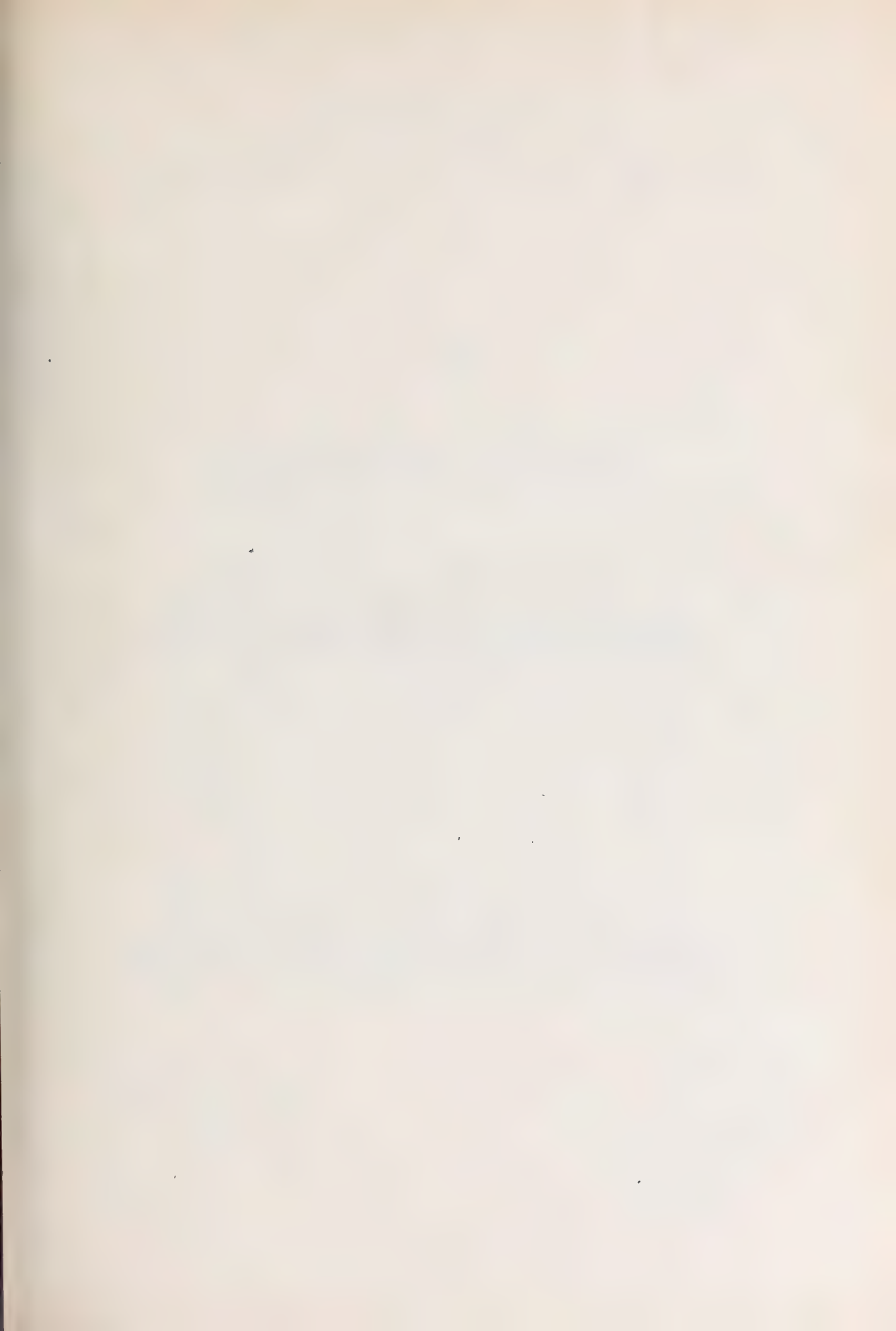
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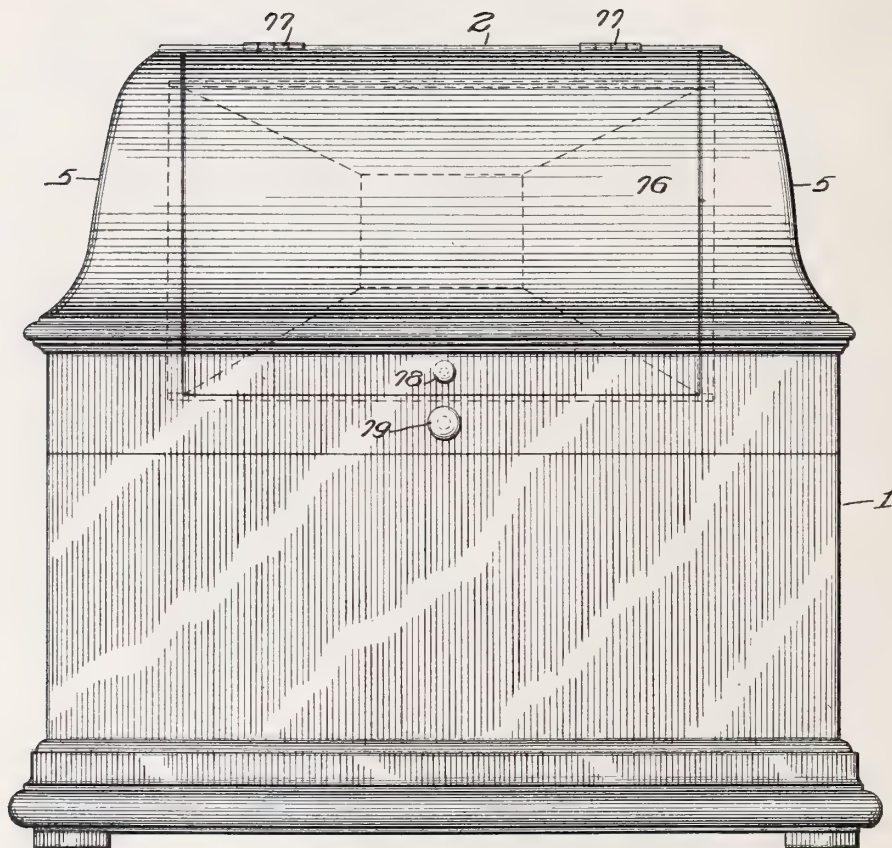
APPLICATION FILED JULY 10, 1909.

1,015,322.

Patented Jan. 23, 1912.

4 SHEETS—SHEET 3.

*Fig. 3.*



WITNESSES

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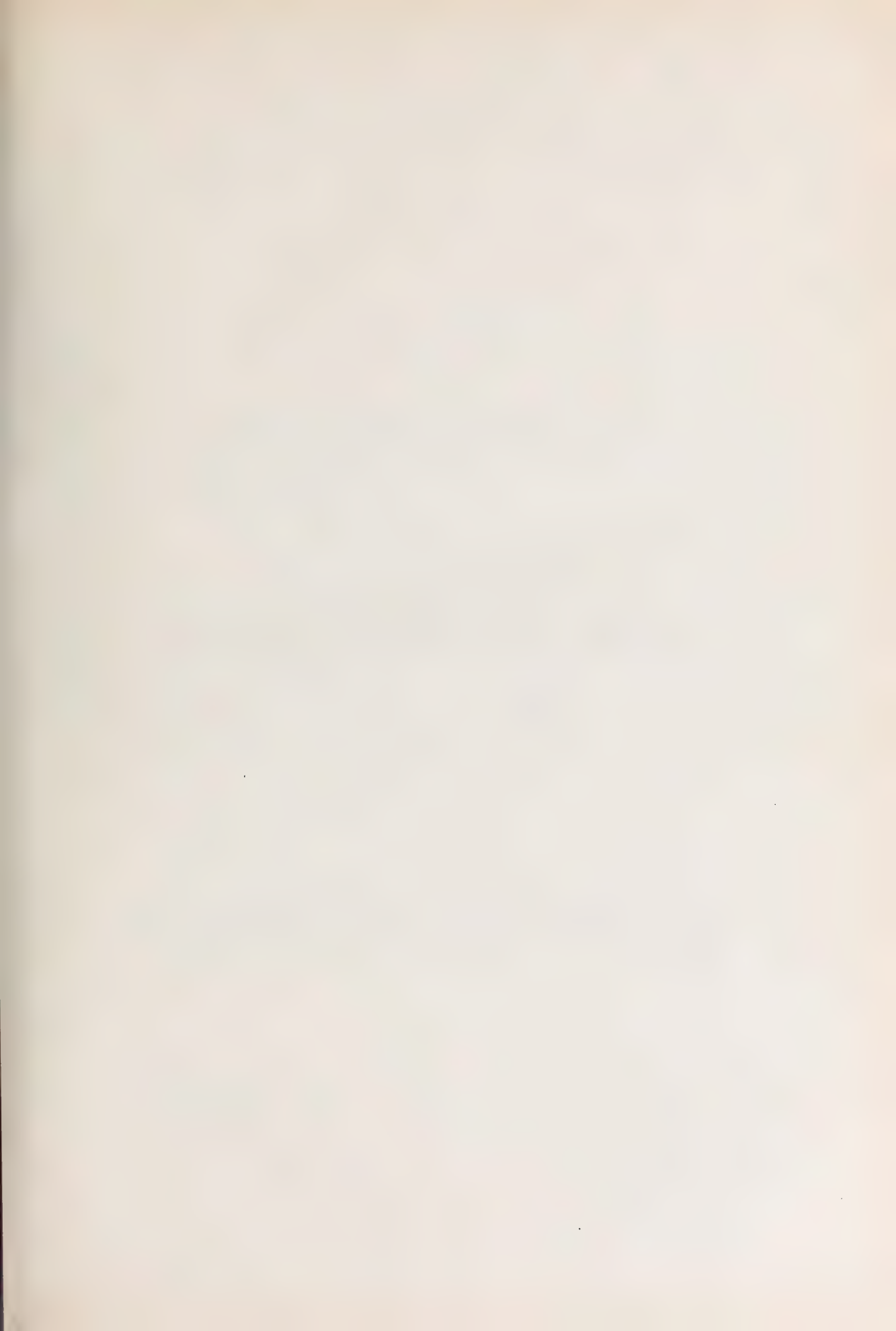
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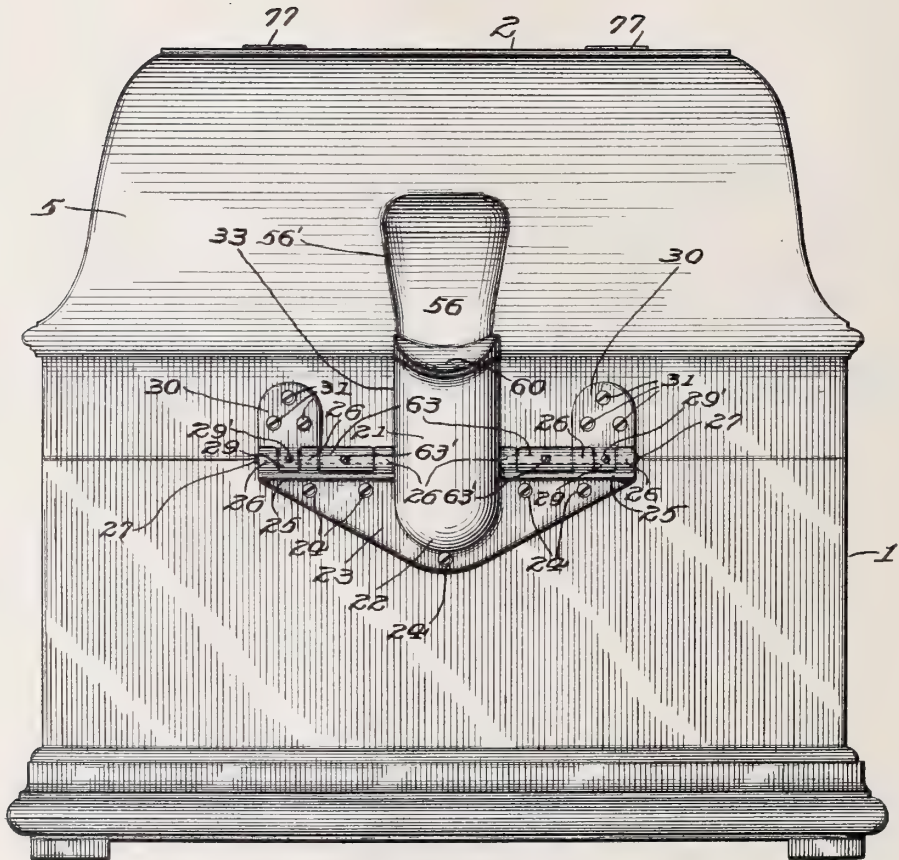


E. R. JOHNSON & J. C. ENGLISH.  
TALKING MACHINE.  
APPLICATION FILED JULY 10, 1909.

1,015,322.

Patented Jan. 23, 1912.  
4 SHEETS—SHEET 4.

*Fig. 4.*



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ATTORNEY

INVENTORS  
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# UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF MERION, PENNSYLVANIA, AND JOHN C. ENGLISH, OF CAMDEN, NEW JERSEY, ASSIGNORS TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

TALKING-MACHINE.

1,015,322.

Specification of Letters Patent.

Patented Jan. 23, 1912.

Application filed July 10, 1909. Serial No. 506,867.

*To all whom it may concern:*

Be it known that we, ELDRIDGE R. JOHNSON and JOHN C. ENGLISH, both citizens of the United States, and residents of Merion, county of Montgomery, State of Pennsylvania, and Camden, county of Camden, and State of New Jersey, respectively, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, clear, and complete disclosure, reference being had to the accompanying drawings, forming part of this specification.

The main objects of this invention are, to provide a compact inclosed talking machine; to provide a talking machine in which the amplifier, the record support, and the actuating mechanism for the record support are inclosed in a cabinet provided with a movable cover, and in which the amplifier is located above the record support and is movable vertically independent of the cover, and in which the sound box arm is supported by a bracket secured to the outside of the rear end of the cabinet and communicates with the major portion of the amplifier through an elbow projecting outwardly through the rear end of the cover; and to provide other improvements as will appear hereinafter.

In the drawings, Figure 1 is a fragmentary side elevation, partly in vertical longitudinal section, of a talking machine constructed in accordance with this invention, the parts of the machine being shown in operative position; Fig. 2 is a similar fragmentary side elevation, partially in longitudinal vertical section of the same but showing the parts in inoperative position; Fig. 3 a front elevation of the same showing the cabinet closed; Fig. 4 a rear elevation of the same.

Referring to the drawings, one embodiment of this invention comprises a casing or cabinet having a body portion 1 open at its upper end and provided with a cover 2 superimposed thereon and hinged thereto upon a horizontal axis forming a closure for the upper end of the body portion. This cover comprises a top 4 having a downwardly flaring rim 5 forming the sides thereof. The body of the cabinet is divided by horizontal partition 6 into an upper compartment 7 and a lower compartment 8, and this partition is provided with a rectangular aperture 9, in which rests a motor casing 10

containing the actuating mechanism (not shown) of the machine.

Upon the top 11 of the motor casing 10, and within the upper compartment 6 of the cabinet, is a rotary disk record support 13 adapted to carry the usual disk sound record 14. Arranged above the record support in position to cooperate therewith is the usual sound box 15 mounted upon the usual U-shaped tube 16 pivotally supported by the free end of a forwardly tapering tubular sound box arm 17. The sound box arm 17 is arranged in a substantially horizontal plane, and the larger end of the arm is curved upwardly through an arc of about 90 degrees and fits rotatably within a cylindrical aperture 19 of an inwardly projecting annular extension 20 of a vertical bracket 21. The bracket 21 supporting the sound box arm projects rearwardly from the cabinet and extends above and below the upper surface of the body of the cabinet. The bracket 21 is substantially semi-cylindrical in shape with a rounded lower end 22, and is provided at its lower end with a substantially flat plate or flange 23 extending laterally in opposite directions from the bracket and secured to the rear face of the rear end of the body of the cabinet by means of screws 24, or other suitable fastening devices. This plate 23 is preferably substantially triangular in shape and is arranged with its upper edge 25 substantially parallel to and slightly below the adjacent upper edge of the body of the cabinet, and the plate is provided along this edge with upwardly projecting apertured lugs or eyes 26, in which engages a pintle 27 surrounding which are two movable eyes 29 each integral with a leaf or plate 30 secured to the outside of the rear wall of the cover by screws 31 or other suitable means forming a hinge connecting the cover to the body of the cabinet. Each of the eyes 29 fixed to the cover may be provided with a set screw 29' threaded through one side of the eye and adapted to engage the pintle to hold the pintle rigid with the eye to be rotated by the cover. The pintle 27 also forms a pivotal support for two L-shaped brackets 32 carrying the major portion of the amplifier, as will be described hereinafter. The inner face of the bracket 21 supporting the sound box arm is suitably recessed to receive the



larger end of the sound box arm, and to permit of the necessary movement thereof, and the back of the cabinet is also suitably recessed for the same purpose. The lower edge of the cover is recessed as at 33 to fit snugly around the side edges of that portion of the bracket 21 which projects above the plane of the body of the cabinet.

For rotatably supporting the sound box arm 17, a vertical pivot 35 is rotatably secured at its upper end centrally in a spider 36, which fits snugly within the cylindrical opening 19 of the bracket 21 and above the end of the sound box arm. The lower end of the pivot 35 is rotatably seated in a suitable socket 38, in a lug 39, integral with the lower end of the bracket, a spiral spring 40 being interposed between the lower end of the pivot and the lower end of the socket and yieldingly supporting the pivot. The pivot passes through a lug or sleeve 41 projecting downwardly from the sound box arm and integral therewith, and the sound box arm is held in fixed position with respect to the pivot by means of a set screw 42, which is threaded into the lug 41 and engages against the pivot. The sound box arm is thus mounted to swing in a horizontal plane about a fixed vertical axis.

The tapering tubular sound box arm 17 may be considered as forming the neck or smaller end of a sectional sound amplifier, the body or major portion, 45, of which is movable with respect to the neck. This body 45 is preferably rectangular and oblong in transverse section, comprising two flat sounding boards 46 and 47 forming the top and bottom respectively of the body, and two flat vertically arranged boards 48 and 49 forming the sides of the body. The top and bottom sounding boards diverge forwardly slightly, and the side sounding boards also diverge forwardly but to a greater degree than the top and bottom boards. The inner ends of these four sounding boards are snugly fitted in a transversely rectangular socket 55, formed by the outer end of a hollow rigid longitudinally tapering elbow 56. The rear or smaller portion of the elbow 56 curves downwardly preferably through about 90 degrees, extending freely through a recess 56' in the lower edge of the rear side of the cover and terminates in a cylindrically concave end 57 adapted to engage against the coaxial cylindrically convex end 58 of the upper portion of the fixed bracket 21, supporting the sound box arm. The axis of curvature of the cylindrical end of the elbow and of the bracket is preferably coincident with the axis of the pintle 27 of the hinge connecting the cover to the body of the cabinet so that the movement of the body of the amplifier may be made to correspond with the movement of the cover.

The lower end of the elbow is provided with an inwardly extending cylindrical shield 59, the lower surface of which is flush with the end of the elbow and the upper end of the bracket 21 is provided with a similar rearwardly extending projection or shield 60 integral therewith, having a cylindrical surface flush with the cylindrical end of the bracket, the shield on the elbow acting as a closure for the inner portion of the bracket, and the shield on the bracket acting as a closure for the outer portion of the elbow when the elbow is swung rearwardly about its axis.

The elbow 56 supporting the body of the amplifier is mounted upon and carried by two substantially L-shaped brackets 30 arranged vertically within the cabinet upon opposite sides of the elbow. Each of these brackets 30 is provided at its upper end with an inwardly extending lug 61 rigidly connected to the elbow 56 by means of screws 62 or other suitable means, and the lower end of each bracket projects through a suitable recess in the rear wall of the body of the cabinet and is provided with an eye 63 surrounding and supported by the previously described pintle 27 of the hinge between the cover and body of the cabinet. Each eye 63 may be provided with a set screw 63' whereby the L-shaped bracket may be rigidly secured to the pintle. The recesses containing the lower ends of the L-shaped brackets are proportioned to permit the necessary amount of rotation of the brackets but the bottom walls of the recesses may be positioned to limit the downward movement of the brackets and to hold the body of the amplifier in a substantially horizontal position.

One of the L-shaped brackets supporting the body of the amplifier is provided at the apex of the angle between its two arms with an inwardly projecting segment 65 having spaced notches 66 arranged in an arc concentric with the pintle 27, and adapted to be engaged by the upper curved end 67 of an upwardly extending spring 68, the lower end of which is rigidly secured by a screw 69 to the horizontal partition 6 of the cabinet. The segment and the spring cooperate in a well known manner to hold the L-shaped bracket in a fixed position but permitting of its manual adjustment about its axis. The body of the amplifier is thus mounted upon a horizontal axis coincident with the axis of movement of the cover of the cabinet and will be held in any position of adjustment by means of the segment and spring 67.

For supporting the cover 2 in any desired position of movement about its axis, a bar 70 is pivoted at one end to the inner surface of one side of the cover of the cabinet, and is provided adjacent its opposite end upon

its under edge with a series of notches 71 adapted to receive a pin 72, which extends across an aperture 73 in a plate 74 attached to the upper side of the horizontal partition 6, the partition being provided with an aperture resting with the aperture in the plate to permit the bar 70 to pass freely therethrough and to be adjusted longitudinally to engage the pin in any one of the series of notches in the bar.

For permitting the sounds to issue from the delivery end of the amplifier through the front end of the cover of the cabinet, the front end of the cover is provided with a rectangular aperture 75 of substantially the same dimensions as the delivery end of the amplifier, and a door or closure 76 is hinged as at 77 to the top wall of the cover and is adapted, when inclosed, to completely fill the opening through the cover. The door 76 is provided upon the front side of its lower portion with a knob 78 whereby the door may be operated, and the cover 2 of the cabinet is also provided upon the lower portion of its front side with a knob 79 for convenience of operation.

By the manipulation of the set screws 29' and 63' the cover of the cabinet and the body of the amplifier may be both secured rigidly to the pintle 27 by which they are carried, and when thus secured, the cover and the body of the amplifier will move in unison, but if preferred either the cover or the body of the amplifier or both the cover and the body of the amplifier may be loosened upon the pintle to be free to revolve with respect thereto, and in either of these latter cases the cover may be moved independently of the body of the amplifier.

The internal surfaces of the downwardly flaring sides of the cover of the cabinet form with the inner surface of the top of the cover, a flaring reflector which may be inclined to direct the sound waves set up in the air within the cabinet surrounding the body of the amplifier outwardly through the space between the cover and the body of the cabinet to mingle with the sounds issuing from the mouth of the amplifier.

When not in operation, the device is ordinarily kept with the sound box inverted upon its arm and at one side of the amplifier, and with the amplifier in its lowest position, and with the cover and door of the cabinet closed.

When it is desired to operate the machine, the cover is first raised and held in suitable position by means of the notched bar 70. This raising of the cover will also raise the body of the amplifier when the cover and the body are both rigidly secured to the pintle 27 as heretofore described. A record is then placed upon the record support, whereupon the sound box is swung into position to cooperate therewith and the actual-

ing mechanism is then released. The cover may then be closed upon the body of the cabinet, thus lowering the body of the amplifier into a horizontal position. The door 76 of the cover 2 may then be inverted above the cover in its open position to permit the sounds to issue without interruption through the front end of the cover, or if it is desired to muffle or soften the reproduction, the door may be closed or may be held partially closed by any suitable means.

When the cover is arranged to move independently of the body of the amplifier it is obvious that the body of the amplifier may be adjusted in a substantially horizontal or other suitable position and will be held in place by the spring catch and the cover may be suitably inclined above the amplifier to act as a reflector.

Although only one form of this invention is here illustrated, it is obvious that the invention is not limited to the particular form shown, as many changes might be made in the construction without departing from the spirit of the invention or the scope of the appended claims.

Having thus described our invention, we claim and desire to secure by Letters Patent of the United States:—

1. In a talking machine, the combination with a cabinet provided with a movable cover, of sound reproducing means in said cabinet, and an amplifier having its major portion in said cabinet and mounted to swing independently of said cover upon an axis substantially coincident with the axis of movement of said cover, and means between said cover and said major portion to secure the same rigidly together to move in unison.

2. In a talking machine, the combination with a cabinet comprising a body portion and a cover, of a pintle upon which said cover is mounted to swing, sound reproducing means within said cabinet, and an amplifier having its major portion extending within said cabinet and supported by said pintle and movable independently of said cover.

3. In a talking machine, the combination with a cabinet comprising a base portion and a movable cover, of sound reproducing means within said cabinet, an amplifier having its major portion projecting through said cabinet, and mounted to swing independently of said cover.

4. In a talking machine, the combination with a cabinet comprising a base portion and a movable cover, of sound reproducing means within said cabinet, an amplifier having its major portion projecting through said cabinet, and mounted to swing independently of said cover, and means between said cover and said major portion to connect the same together to move in unison.



5. In a talking machine, the combination with a cabinet comprising a base portion and a movable cover, of sound reproducing means within said cabinet, an amplifier having its major portion projecting through said cabinet, and mounted to swing independently of said cover, and means between said cover and said major portion to secure the same rigidly together to move in unison. 70
6. In a talking machine, the combination with a cabinet having a body portion and a movable cover, of a pintle and means co-operating therewith connecting the cover movably to said body portion, an amplifier projecting in said cabinet and having its major portion mounted independently of said cover and upon said pintle, and means between said cover and said major portion to secure the same rigidly together to move in unison. 75
7. The combination with a cabinet comprising a body portion and a movable cover, of a rotary record support mounted within said body portion, a sound box arranged to coöperate with said record support, a sound box arm carrying said sound box, a bracket projecting outside of said cabinet and secured thereto supporting said sound box arm, a pintle carried by said bracket, means coöperating with said pintle for movably connecting said cover to said body portion, and sound amplifying means mounted to swing on said pintle independently of said cover. 80
8. The combination with a cabinet comprising a body portion and a movable cover, of a rotary record support mounted within said body portion, a sound box arranged to coöperate with said record support, a sound box arm carrying said sound box, a bracket projecting outside of said cabinet and secured thereto supporting said sound box arm, a pintle carried by said bracket, means coöperating with said pintle for movably connecting said cover to said body portion, sound amplifying means mounted to swing upon said pintle independently of said cover, and means to connect said sound amplifying means rigidly to said cover to move in unison therewith. 85
9. The combination with a cabinet having a movable cover, of a rotary record support mounted in said cabinet, a sound box arranged to coöperate with said record support, a sound box arm supporting said sound box, a bracket projecting outside of said cabinet and secured thereto supporting said sound box arm, and sound amplifying means movable with respect to said cover and extending through said cabinet and communicating with said sound box arm. 90
10. The combination with a cabinet having a movable cover, of a rotary record support mounted in said cabinet, a sound box arranged to coöperate with said record support, a sound box arm supporting said sound box, a bracket projecting outside of said cabinet and secured thereto supporting said sound box arm to swing upon a fixed axis, sound amplifying means movable with respect to said cover and extending through said cabinet and communicating with said sound box arm, and means to connect said sound amplifying means rigidly to said cover to move in unison therewith. 95
11. The combination with a cabinet having a movable cover, of a record support rotatably mounted therein, a sound box within said cabinet arranged to coöperate with said record support, a sound box arm supporting said sound box, a bracket outside of said cabinet rotatably supporting said sound box arm, and amplifying means projecting through said cover and movable independently thereof. 100
12. The combination with a cabinet having a body and a cover mounted upon said body to swing upon a fixed axis, of a record support rotatably mounted in said body, a sound box within said cabinet, a sound box arm supporting said sound box, a bracket secured to the outside of said body and supporting said sound box, and sound amplifying means projecting through said cover and movable independently thereof on an axis coincident therewith. 105
13. The combination with a cabinet having a body and a cover mounted upon said body to swing upon a fixed axis, of a record support rotatably mounted in said body, a sound box within said cabinet, a sound box arm supporting said sound box, a bracket secured to the outside of said body and supporting said sound box arm, sound amplifying means projecting through said cover and movable independently thereof on an axis coincident therewith, and means to connect said sound amplifying means rigidly to said cover to move in unison therewith. 110
14. The combination with a cabinet having a cover mounted thereon to swing upon a fixed axis and provided with a flaring rim, of amplifying means mounted within said cover to swing coaxially therewith and independently thereof. 115
15. The combination with a cabinet having a cover mounted thereon to swing upon a fixed axis and provided with a flaring rim, of amplifying means mounted within said cover to swing coaxially therewith and independently thereof. 120
16. The combination with a cabinet having a cover mounted thereon to swing upon a fixed axis and provided with a flaring rim, of amplifying means mounted within said cover to swing coaxially therewith and independently thereof. 125
17. The combination with a cabinet having a cover mounted thereon to swing upon a fixed axis and provided with a flaring rim, of amplifying means mounted within said cover to swing coaxially therewith and independently thereof. 130

of amplifying means mounted within said cover to swing coaxially therewith and independently thereof, said rim being provided with an opening opposite said amplifying means, and a movable closure for said opening.

17. The combination with a cabinet comprising a body and a cover, of a bracket projecting outside of said body and extending above and below the upper surface thereof, a plate rigid with the lower end of said bracket and secured to the outside of said body, apertured lugs projecting upwardly from said plate, a pintle in said lugs, eyes carried by said pintle and secured to said cover, a hollow elbow projecting through said cover and cooperating with the upper end of said bracket, means carried by said pintle and extending within said cabinet and supporting said elbow, sound reproducing means within said cabinet supported by said bracket, and sound amplifying means within said cabinet supported by said elbow.

18. In a talking machine, the combination with a cabinet comprising a body and a cover, of a pintle mounted upon said body, an eye surrounding said pintle and secured to said cover, supporting said cover rotatably upon said body, amplifying means projecting in said cabinet, supporting means mounted upon said pintle and rotatable with respect thereto supporting said amplifying means, adjustable means between said eye and said pintle to hold said eye rigid with respect to said pintle, and adjustable means between said supporting means and said pintle to hold said supporting means rigid with respect to said pintle.

19. In a talking machine, the combination with a cabinet provided with a movable cover, of sound reproducing means in said cabinet, and an amplifier projecting outside of said cabinet, having its major portion in said cabinet and mounted to swing independently of said cover upon an axis substantially coincident with the axis of movement of said cover.

20. In a talking machine, the combination with a cabinet provided with a movable cover, of sound reproducing means in said cabinet, and an amplifier projecting outside of said cabinet, having its major portion in said cabinet, and mounted to swing independently of said cover upon an axis substantially coincident with the axis of movement of said cover, and means between said cover and said major portion to secure the same rigidly together to move in unison.

21. In a talking machine, the combination with a cabinet comprising a body portion and a cover, of a pintle upon which said cover is mounted to swing, sound reproducing means within said cabinet, and an amplifier projecting outside of said cabinet, having its major portion extending within

said cabinet, and supported by said pintle and movable independently of said cover.

22. The combination with a cabinet, comprising a body portion, and a movable cover, of a rotary record support mounted within said body portion, a sound box arranged to cooperate with said record support, a sound box arm carrying said sound box, a bracket secured to said cabinet supporting said sound box arm, a pintle carried by said bracket, means cooperating with said pintle for movably connecting said cover to said body portion, and sound amplifying means mounted to swing on said pintle independently of said cover.

23. The combination with a cabinet comprising a body portion and a movable cover, of a rotary record support mounted within said body portion, a sound box arranged to cooperate with said record support, a sound box arm carrying said sound box, a bracket secured to said cabinet supporting said sound box arm, a pintle carried by said bracket, means cooperating with said pintle for movably connecting said cover to said body portion, sound amplifying means mounted to swing upon said pintle independently of said cover, and means to connect said sound amplifying means rigidly to said cover to move in unison therewith.

24. The combination with a cabinet, comprising a body and a movable cover, of a pintle connecting said body to said cover, a hollow elbow extending through said cover and movable with respect thereto, a bracket mounted upon said pintle and supporting said elbow, and sound amplifying means communicating with said elbow.

25. The combination with a cabinet, comprising a body and movable cover, of a pintle connecting said body to said cover, a hollow elbow extending through said cover and movable with respect thereto, a bracket mounted upon said pintle and supporting said elbow, and sound amplifying means carried by said elbow and extending within said cabinet.

26. The combination with a cabinet, comprising a body and a cover, of a pintle connecting said body to said cover, a hollow elbow extending through said cover and movable with respect thereto, means mounted upon said pintle and supporting said elbow, and sound amplifying means carried by said elbow.

27. The combination with a cabinet comprising a body and a cover, of a pintle connecting said body to said cover, a hollow elbow extending through said cover, a bracket mounted upon said pintle and supporting said elbow, and sound reproducing means communicating with said elbow.

28. The combination with a cabinet comprising a body and a cover, of a pintle connecting said body to said cover, a hollow



elbow extending through said cover, a bracket mounted upon said pintle and supporting said elbow, yielding means engaging said bracket to hold said elbow in position, and sound reproducing means communicating with said elbow.

29. The combination with a cabinet comprising a body and a cover, of a hollow elbow projecting through said cover, a bracket mounted upon said pintle and supporting said elbow, said bracket being provided with a segment provided with spaced notches, yielding means adapted to engage in said notches to hold said elbow adjustably in position, and sound reproducing means communicating with said elbow.

30. The combination with a cabinet, comprising a body and a cover, of a pintle connecting said body to said cover, a hollow elbow extending through said cover, means mounted upon said pintle and supporting said elbow, and sound reproducing means communicating with said elbow.

31. The combination with a cabinet, comprising a body and a cover, of a pintle connecting said body to said cover, a hollow elbow extending through said cover, means mounted upon said pintle and supporting said elbow, and sound amplifying means carried by said elbow and extending in said cabinet.

32. In a talking machine, the combination with a cabinet comprising a body portion and a cover mounted to oscillate upon a fixed axis, of sound amplifying means extending within said cabinet and movable with respect to said cover upon an axis coincident with the axis of oscillation of said cover.

33. The combination with a cabinet provided with a movable hollow cover, of a record support, sound reproducing means arranged in coöperative relation with said support, and sound amplifying means having a delivery end extending within said cover and movable with respect thereto.

34. The combination with a cabinet having a body portion and a hollow movable cover, of a record support carried by said body portion, a sound box arranged to coöperate with said record support, and amplifying means inclosed within said cabinet, the major portion of said amplifying means being outside of said body portion and within but independent of said cover.

35. The combination with a cabinet, of a record support, sound reproducing mechanism arranged to coöperate with said support, and amplifying means having its major portion in vertical alinement with said record support and inclosed within but entirely out of contact with said cabinet, and movable into and from a substantially horizontal position.

36. In a talking machine, the combination with a cabinet comprising a stationary body portion and a movable cover superimposed thereon, of sound reproducing means in said cabinet, and an amplifier having a delivery end in said cabinet and arranged to deliver sound from said cabinet in a straight substantially horizontal line from said delivery end through the space between said body portion and said cover, when said cover is open.

37. In a talking machine, the combination with a cabinet comprising a stationary body portion and a movable cover connected thereto, of sound reproducing means in said cabinet, and an amplifier having a delivery end in said cabinet and arranged to deliver sound from said cabinet in a straight line from said delivery end and through the space between said cover and said body when said cover is open, said delivery end being movable independently of said cover.

38. In a talking machine, the combination with a cabinet comprising a stationary body portion and a movable cover connected thereto, of sound reproducing means in said cabinet, and an amplifier having a delivery end in said cabinet and arranged to deliver sound from said cabinet in a straight line from said delivery end and through the space between said cover and said body when said cover is open, said cover being hollow and having a flaring rim whereby the cover acts as a concave sound deflector.

39. In a talking machine, the combination with a cabinet comprising a body portion and a movable cover, of sound amplifying means within said cabinet and movable independently of said cover, and means adjustable to connect said amplifying means to said cover, to be moved thereby.

40. In a talking machine, the combination with a cabinet comprising a body portion and a movable hollow flaring cover, of amplifying means having a delivery end extending within said cabinet and movable with respect to said cover.

41. In a talking machine, the combination with a cabinet comprising a body portion and a movable closure, of sound amplifying means carried by said closure and angularly adjustable into various fixed positions with respect thereto.

42. In a talking machine, the combination with a cabinet, comprising a body portion and a movable closure therefor, of sound reproducing means inclosed by said cabinet, and hollow sound conducting means communicating with said sound reproducing means and extending freely through said cover, said cover being movable independently of said sound conducting means.

43. In a talking machine, the combination with a cabinet, comprising a body portion

and a hollow movable cover, of sound reproducing means in said cabinet, sound amplifying means having a delivery end extending within said cover, means of communication between said sound reproducing means and said sound amplifying means extending freely through said cover.

44. In a talking machine, the combination with a cabinet comprising a body portion and a movable closure therefor, of hollow sound conveying means carried by said closure and angularly adjustable into various fixed positions with respect thereto.

45. In a talking machine, the combination with a cabinet comprising a body portion and a movable closure therefor, of sound amplifying means having a delivery end inclosed by said cabinet and carried by said closure and angularly adjustable into various fixed positions with respect thereto.

46. In a talking machine, the combination with a cabinet, comprising a body portion and a cover movable with respect to said body portion upon a fixed axis, of hollow sound conveying means extending in said cabinet and angularly adjustable into various fixed positions with respect to said

cover about an axis coincident with the said axis of said cover.

47. In a talking machine, the combination with a cabinet, comprising a body portion and a cover movable with respect to said body portion upon a fixed axis, of hollow sound conveying means extending in said cabinet and angularly adjustable into various fixed positions with respect to said cover about an axis coincident with the said axis of said cover, said sound conveyer being arranged to be moved independently of said cover or to be secured to said cover to be oscillated thereby.

Signed by me, ELDRIDGE R. JOHNSON, at Camden, State of New Jersey, this 9th day of July, 1909.

ELDRIDGE R. JOHNSON.

Witnesses:

RALPH L. FREEMAN,

FRANK BARCLAY MIDDLETON, Jr.

Signed by me, JOHN C. ENGLISH, at Camden, State of New Jersey, this 9th day of July, 1909.

JOHN C. ENGLISH.

Witnesses:

EDWARD KARCHER MACEWAN,

CHARLES CHRISTOPHER MORE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."







C. VOGT.

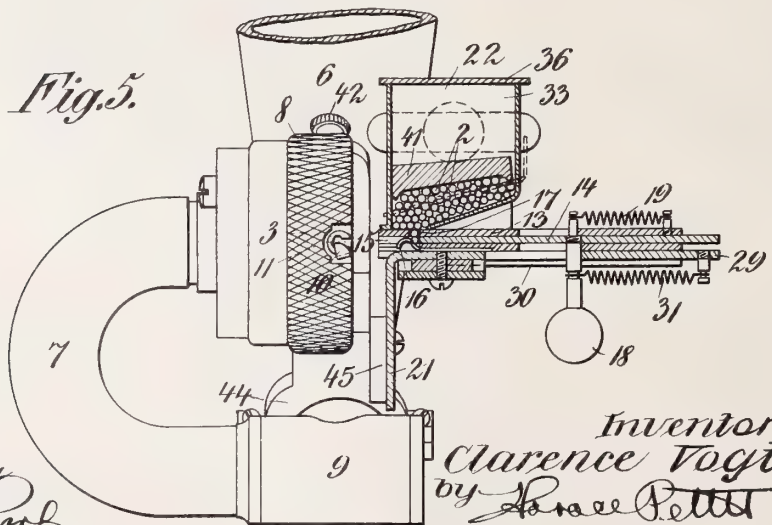
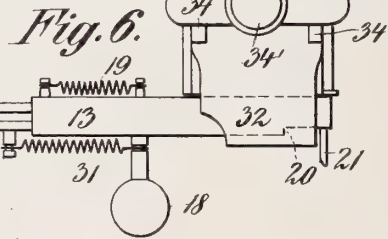
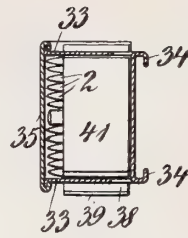
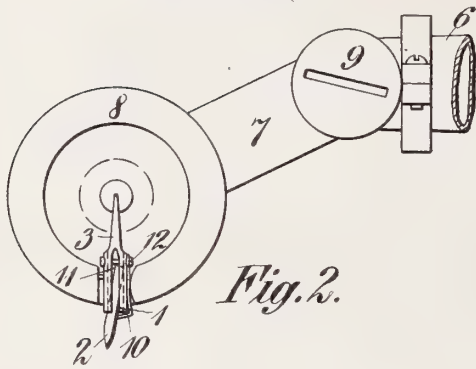
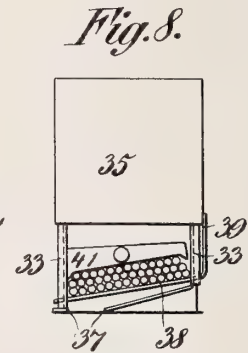
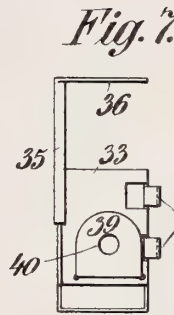
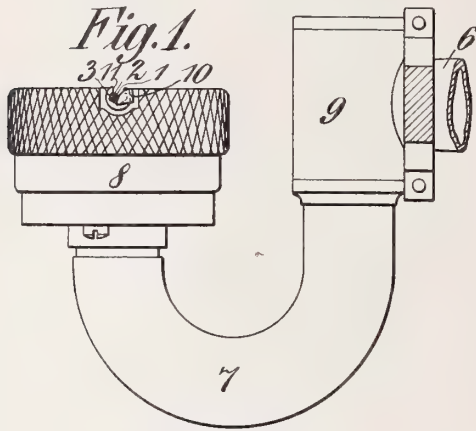
NEEDLE HOLDER FOR THE SOUND BOXES OF TALKING MACHINES.

APPLICATION FILED AUG. 24, 1905.

1,015,363.

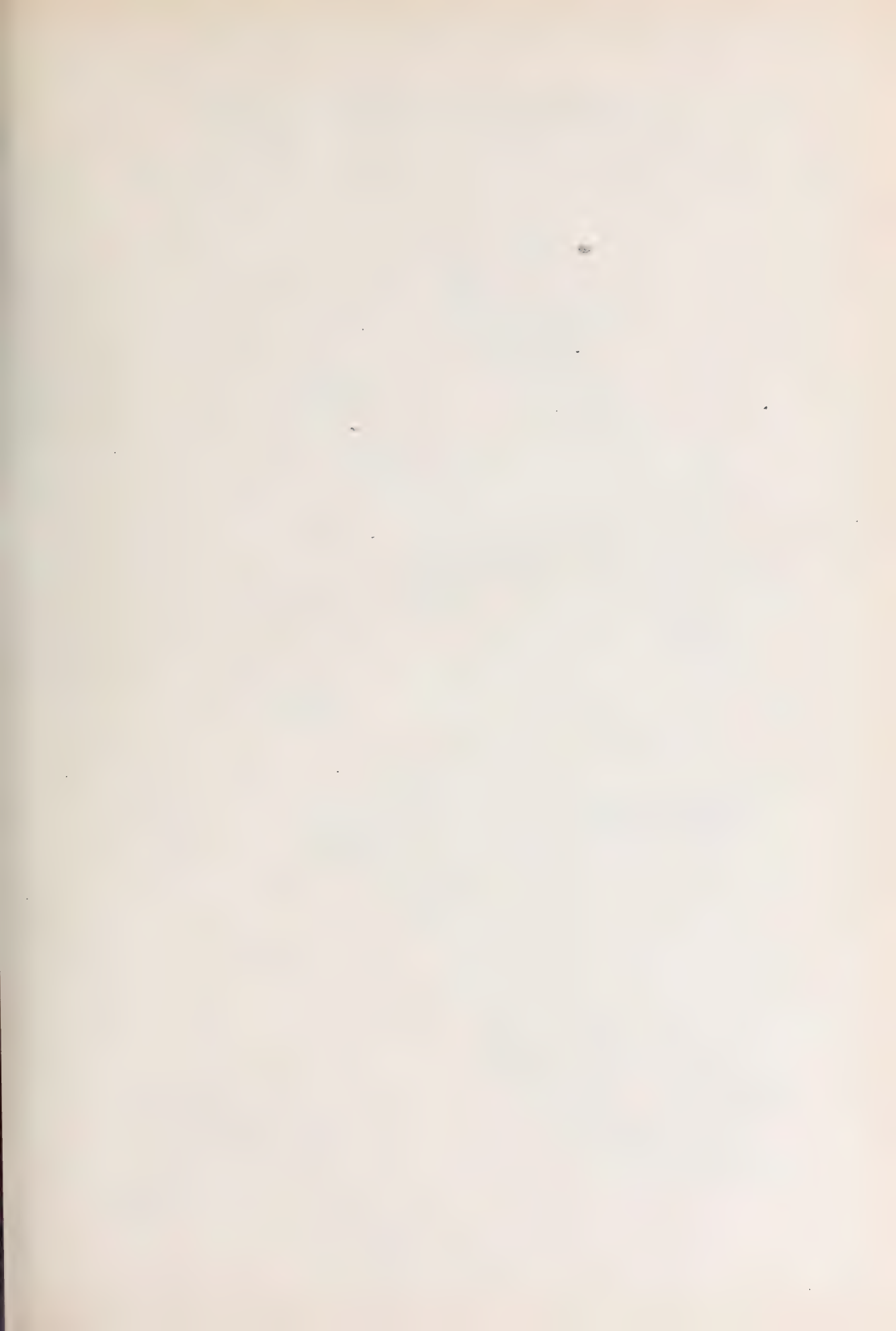
Patented Jan. 23, 1912.

7 SHEETS—SHEET 1.



Witnesses  
F. E. Barry  
Alexander Park

Inventor  
Clarence Vogt  
by James Pettit  
Attorney.





C. VOGT.

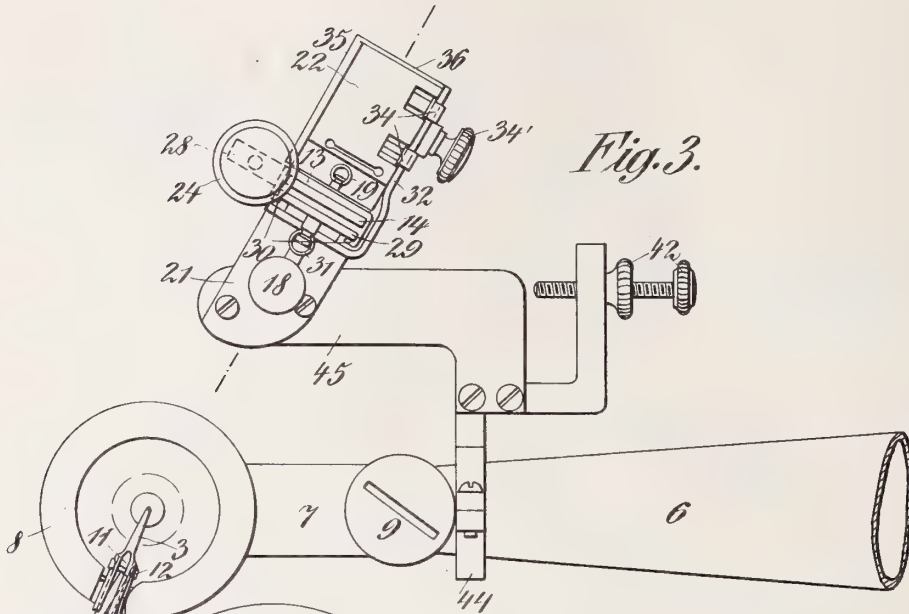
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APPLICATION FILED AUG. 24, 1905.

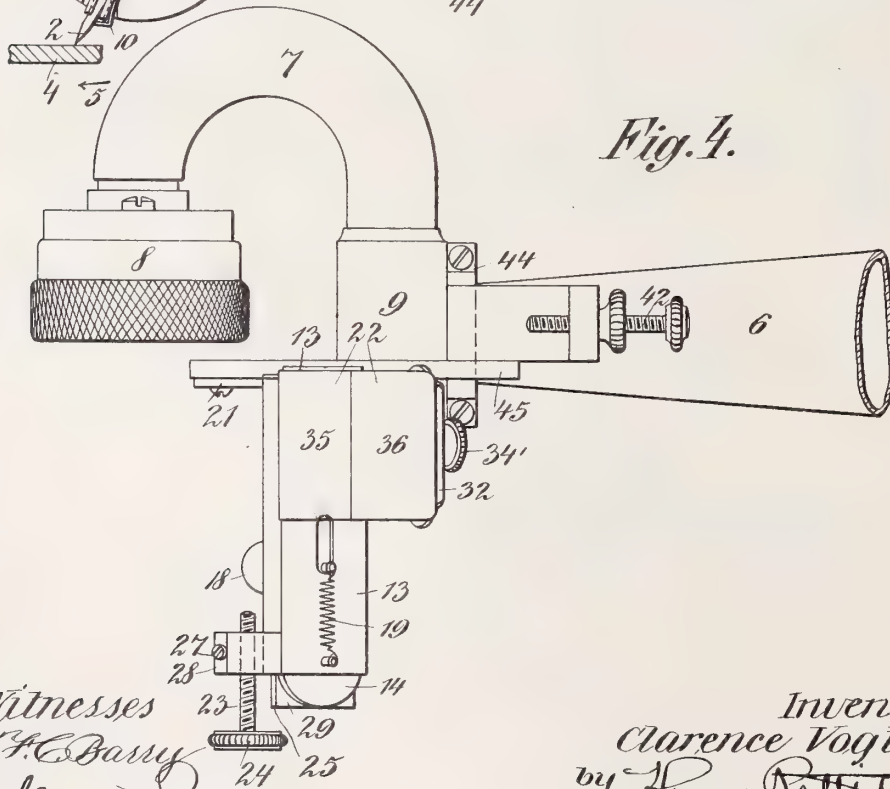
1,015,363.

Patented Jan. 23, 1912.

7 SHEETS—SHEET 2.



*Fig. 3.*

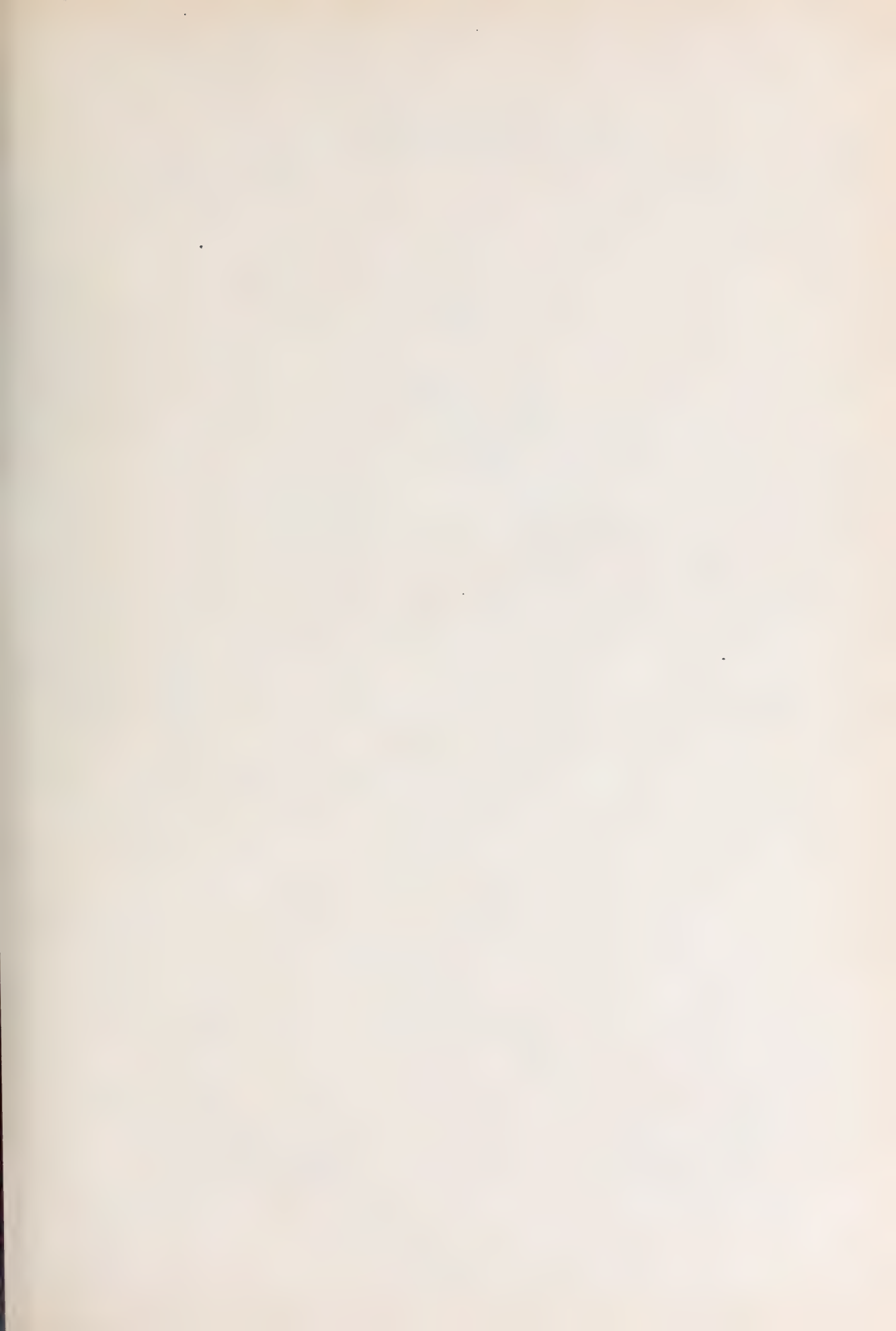


*Fig. 4.*

Witnesses

*F. C. Barry*  
*Alexander Stark*

Inventor  
*Clarence Vogt*  
by *James Pettit*  
attorney.



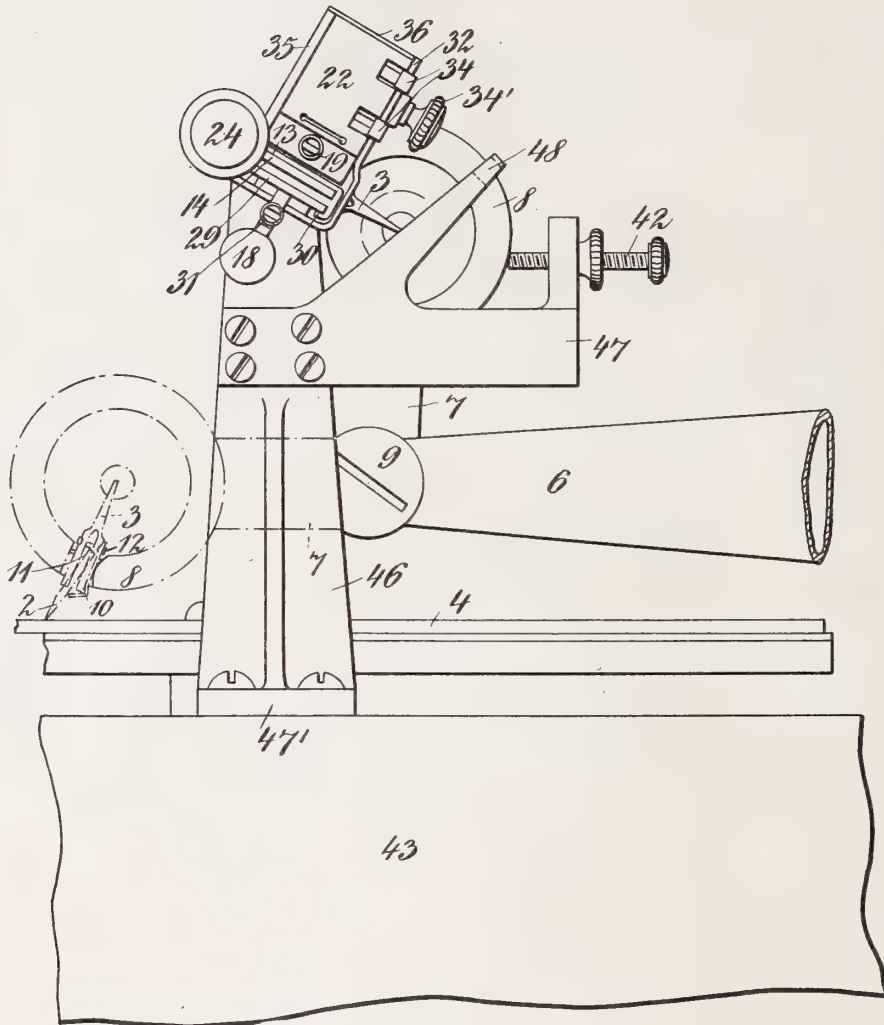
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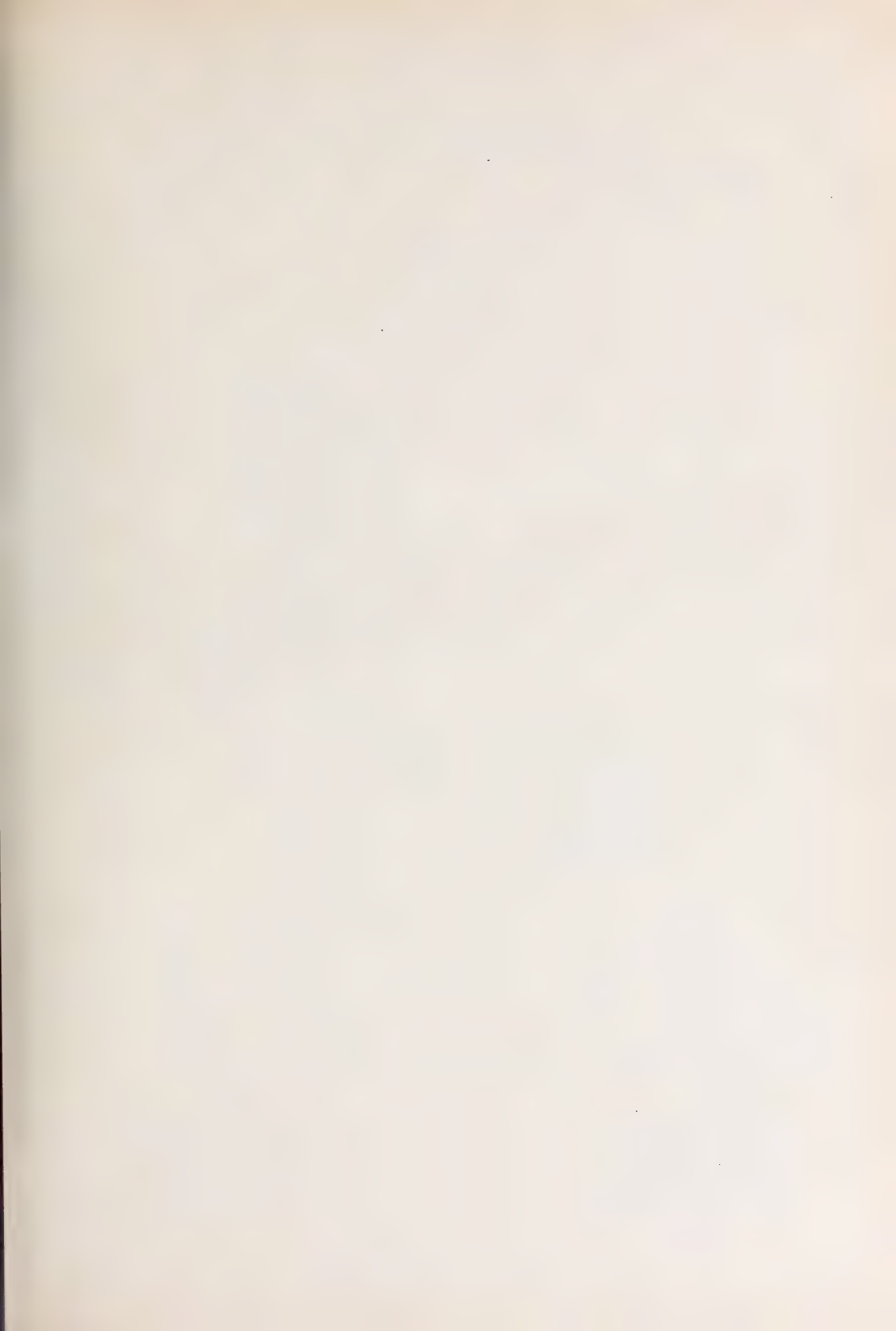
7 SHEETS—SHEET 3.

*Fig. 10.*



*Witnesses*  
*F. C. Barry*  
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*attorney.*





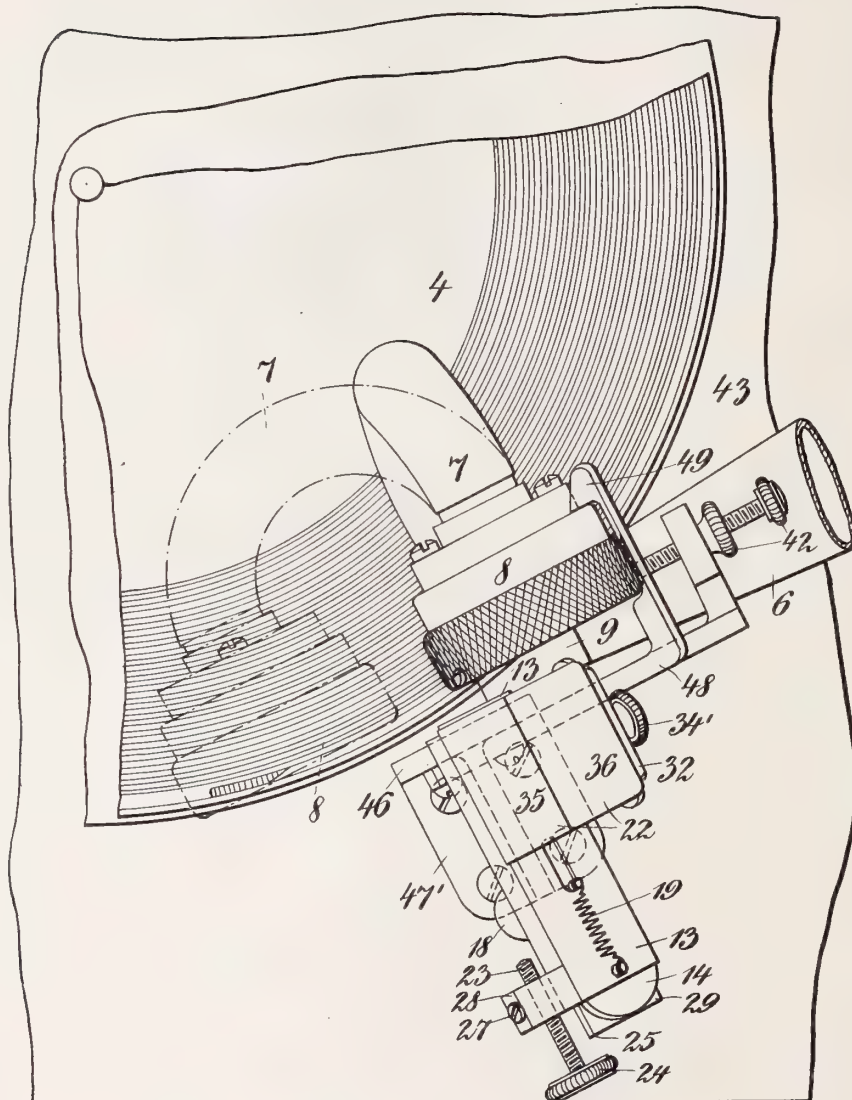
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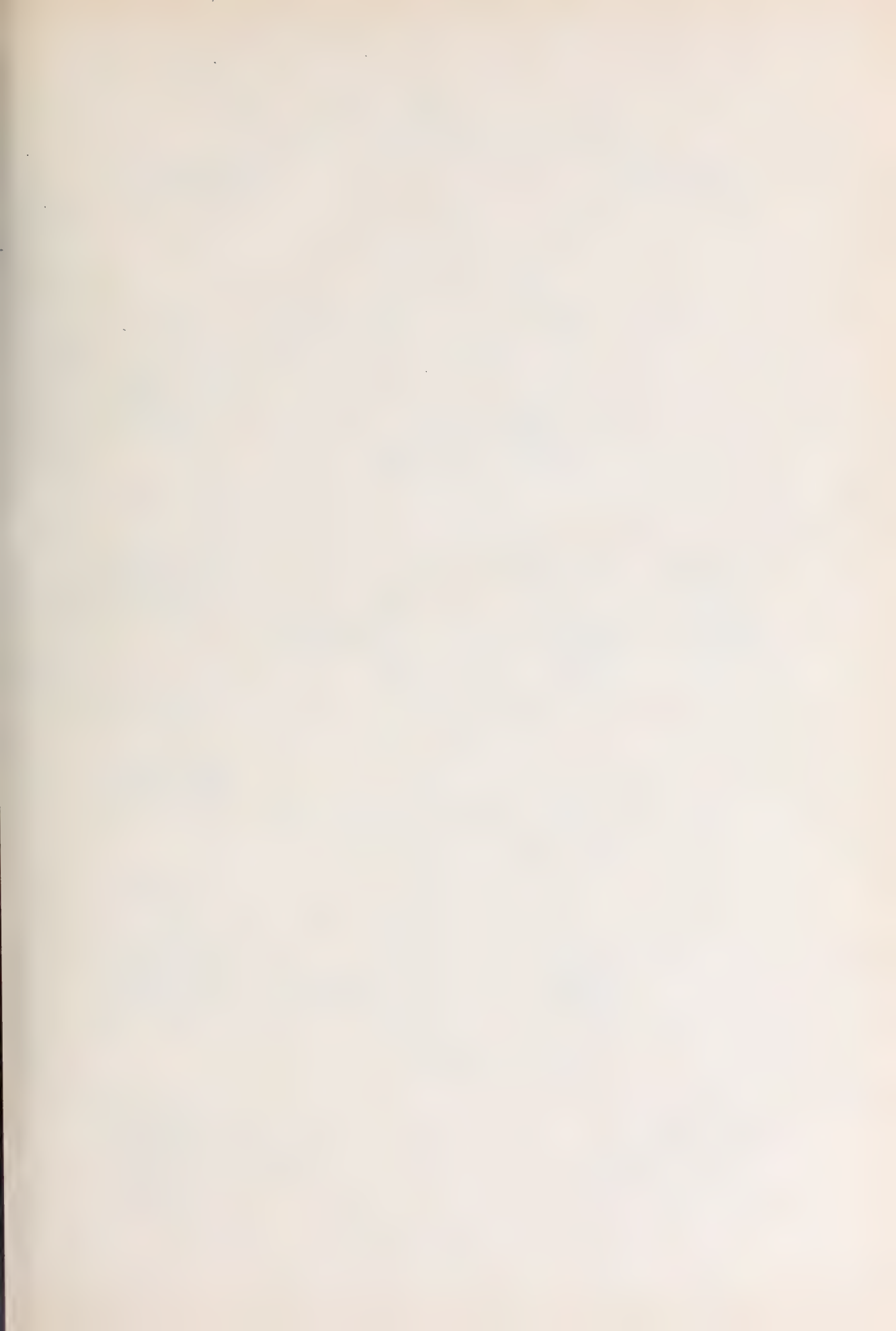
7 SHEETS—SHEET 4.

*Fig. 11.*



Witnesses  
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C. VOGT.  
 NEEDLE HOLDER FOR THE SOUND BOXES OF TALKING MACHINES.  
 APPLICATION FILED AUG. 24, 1905.

1,015,363.

Patented Jan. 23, 1912.

7 SHEETS—SHEET 5.

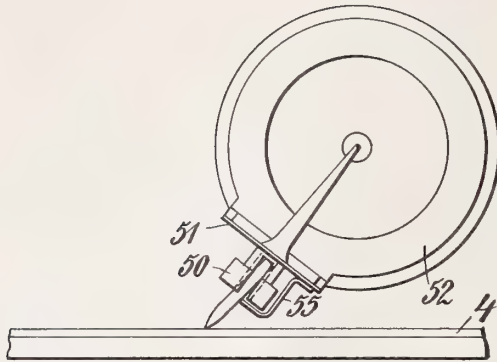


Fig. 12.

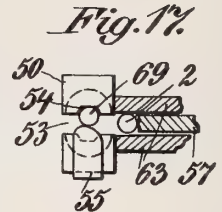


Fig. 17.

Fig. 14.

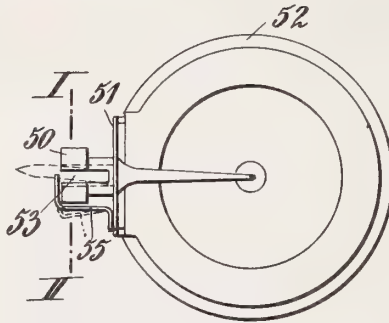
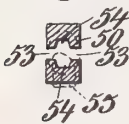


Fig. 13.

Fig. 18.

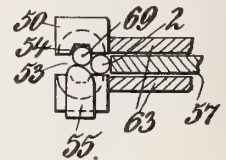


Fig. 19.

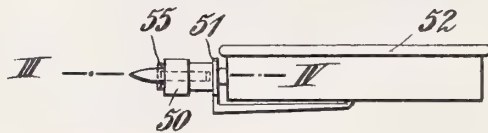
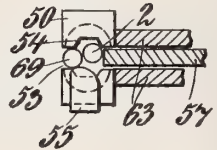


Fig. 15.

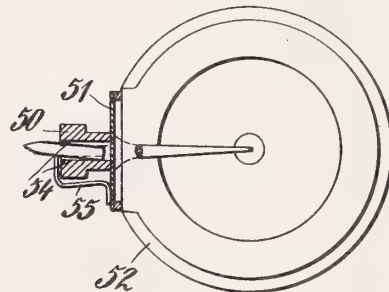
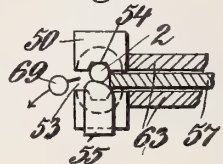


Fig. 16.

Fig. 20.



Witnesses  
*F. C. Barry*  
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Inventor  
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 by *Harold Pettit*  
 Attorney.





C. VOGT.

NEEDLE HOLDER FOR THE SOUND BOXES OF TALKING MACHINES.

APPLICATION FILED AUG. 24, 1905.

1,015,363.

Patented Jan. 23, 1912.

7 SHEETS—SHEET 6.

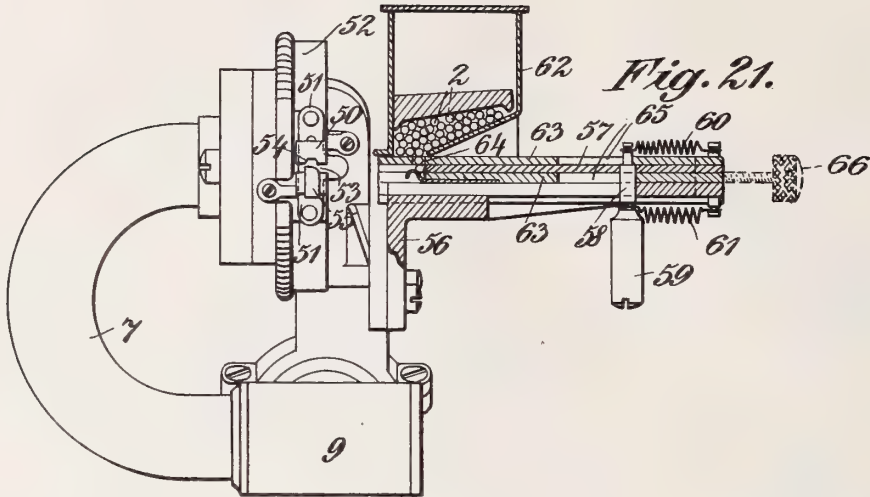


Fig. 21.

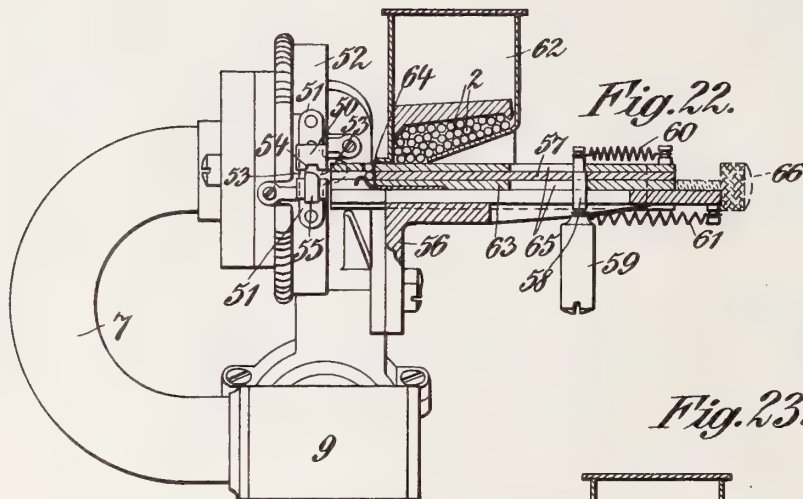


Fig. 22.

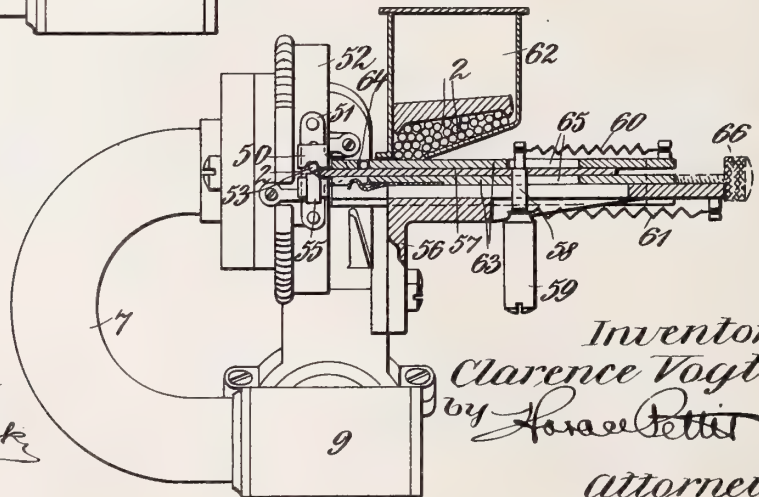


Fig. 23.

Witnesses  
F. C. Barry  
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attorney

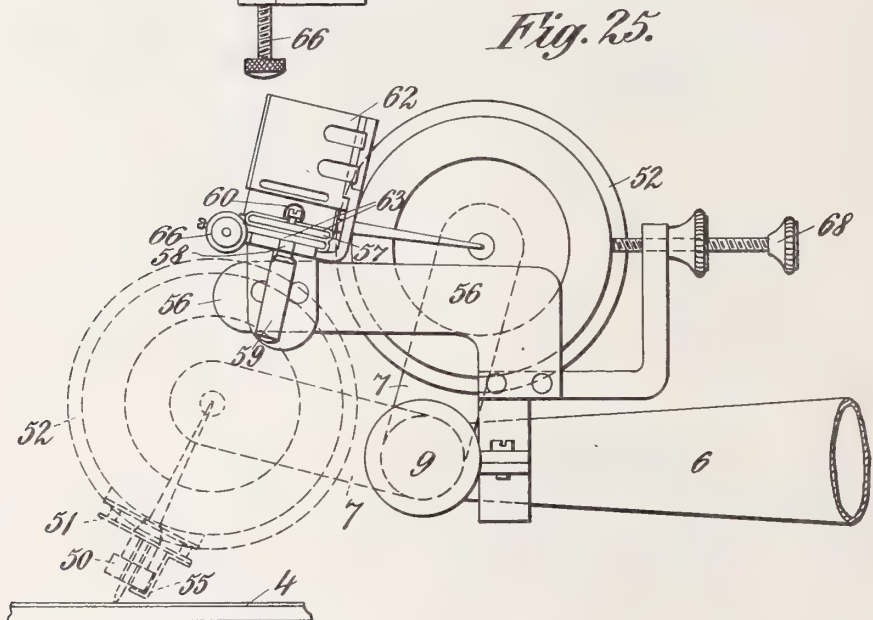
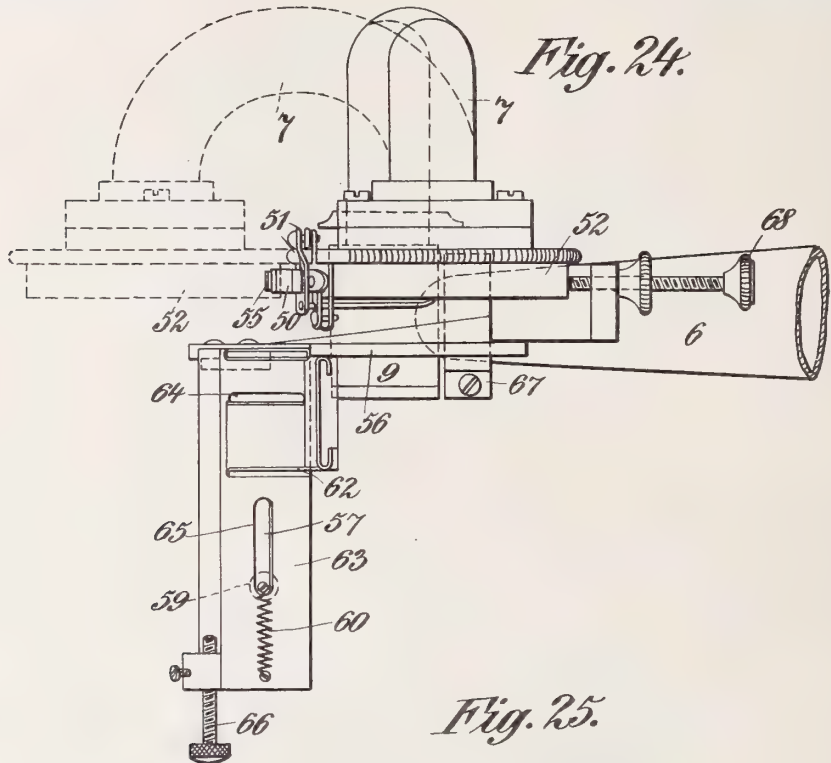


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 APPLICATION FILED AUG. 24, 1905.

1,015,363.

Patented Jan. 23, 1912.

7 SHEETS—SHEET 7.



Witnesses  
*F. C. Barry*  
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Inventor  
*Clarence Vogt*  
 by *Harold Pettit*  
 Attorney.

# UNITED STATES PATENT OFFICE.

CLARENCE VOGT, OF BERLIN, GERMANY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO  
VICTOR TALKING MACHINE COMPANY, OF CAMDEN, NEW JERSEY, A CORPORATION  
OF NEW JERSEY.

NEEDLE-HOLDER FOR THE SOUND-BOXES OF TALKING-MACHINES.

1,015,363.

Specification of Letters Patent.

Patented Jan. 23, 1912.

Application filed August 24, 1905. Serial No. 275,516.

*To all whom it may concern:*

Be it known that I, CLARENCE VOGT, citizen of the United States of America, residing at Berlin, in the Empire of Germany, have invented certain new and useful Improvements Relating to Needle-Holders for the Sound-Boxes of Talking-Machines, of which the following is a specification.

This invention relates to needle-holders for the sound-boxes of talking machines, and more particularly to needle-holders or stylus bars of the kind in which the insertion and securing of the needle is effected without the employment of screws or similar fastening means. For this purpose, such needle-holders are provided with clamping means, in which the needle is held by friction so as to be capable of being freely changed, additional spring pressure being provided if required. The needle is secured in its correct position by the pressure of the sound box on the record and the clamping means are preferably oppositely-located in the bore of the needle-holder, so that the needle is grasped and held at the upper end by one and at the lower end by the other clamping means. It may be understood that the invention relates also to needle-holders having in the usual manner screws for fastening the needle, eventually in combination with clamping places.

An important feature of the present invention consists in that a lateral longitudinally-extending slot is provided in the needle-holder near the clamping means, through which slot the needle can be conveniently introduced into and removed from its operative position between the clamping means through the sides of the needle-holder, the said needle meanwhile moving parallel to its longitudinal direction. This lateral insertion of the needle presents the advantage that, for the insertion and replacement of the needle, a mechanical device can be arranged whereby the needles are fed, moving parallel to themselves, into the lateral slot in the needle-holder, in the contradistinction to the known needle-changing devices in which the needles are moved along in the direction of their axes. The lateral insertion of the needle further presents the possibility of arranging the mechanical needle-changing device independently of the

sound-box and of its carrier-arm and of thereby relieving the sound-box of the weight of the needle-carrying device. The needle-holder can be provided, on the side opposite to the inlet slot, with an additional slot which serves for the feeding out of the needles. This preferably takes place in such a manner that the new-needle introduced laterally into the needle-holder automatically pushes out the already used needle still in the holder, at the other side.

A separate locking or holding device may, if desired be provided on the needle-holder, this device being constructed in such a manner that it holds the needle elastically in the normal position, but automatically opens by the lateral pressure when a needle is inserted and replaced. The locking or holding means for the needle when the needle-holder is made with two oppositely-arranged slots, is formed in such a manner that when inserting a new needle the previously used one is thrown out of the holder by a spring.

In the drawing, Figure 1 is an underside view of a sound-box which is pivotally attached to the sound-box arm and which has a needle-holder provided with clamping means and lateral slots, and which has a retaining spring for the needle. Fig. 2 is a side elevation corresponding to Fig. 1. Fig. 3 is a side elevation of a sound-box and needle-holder with a lateral slot and spring, in combination with a device whereby the needles are fed out of a needle-magazine to the lateral slot of the needle-holder. Fig. 4 is a plan of this device for changing the needles, with the sound-box depressed. Fig. 5 is an oblique elevation looking from the front with the sound-box swung up, and with the needle-magazine and the needle-changing device in section. Fig. 6 is a rear elevation of the needle-changer. Figs. 7 to 9 show an example of construction of the needle-magazine in different kinds of elevation, Fig. 7 being a side elevation with the front wall somewhat drawn up, Fig. 8 a front elevation, and Fig. 9 a horizontal section of Fig. 7. Fig. 10 is a partial side elevation of a talking machine looking in the direction of the arrow A of Fig. 11. Fig. 11 is the plan corresponding to Fig. 10. Fig. 12 shows a sound-box with a needle-holder having two slots and an inserted needle in



the operative position. Fig. 13 is an elevation of the sound-box looking toward the needle-holder. Fig. 14 is a transverse section on the line I—II, Fig. 13. Fig. 15 is a plan corresponding to Fig. 13. Fig. 16 shows the needle-holder in section and similar elevation to Fig. 13. Figs. 17–20 show diagrammatically and to an enlarged scale, how a new needle is inserted into the needle-holder and the previously used needle removed. Figs. 21–23 are views of the needle-holder with two slots, in combination with a needle-changer in different operative positions of the latter. Fig. 24 is the corresponding plan and Fig. 25 a side elevation.

In the form of construction shown in Fig. 1, the needle 2 is in the bore 1 of the needle-holder 3. The bore 1 is not round in cross-section but is enlarged in the direction of the sound waves. The bore 1 is preferably bounded by inclined surfaces, between which the needle 2 can rest firmly. The clamping places can also form curved surfaces, so that the bore 1 has a substantially elliptical cross-section. The force required for the clamping of the needle is produced by the friction of the needle on the record 4 in the rotation of the latter in the direction of the arrow 5 (see Fig. 3) and by the working pressure, with which the sound-box is pressed against the record.

The sound-box 8 is arranged in a known manner on the hollow arm 6 by means of a U-shaped connecting-piece 7 and a pivotal joint 9, so as to be capable of being moved up and down and so that the weight of the sound-box 8 produces the downwardly directed working pressure. Since the needle 2 rests obliquely on the record 4, the reactive force acts obliquely on the point of the needle 2.

The needle 2 can be introduced by hand into the bore 1 and be held fast until the sound-box is depressed to bring the needle 2 on to the record 4. After the depression of the sound-box, the needle can be released since the clamping of the needle is caused by the supporting thereof on the record. The needle 2 can also be held in the bore by means of a spring 10 (Fig. 1) until the said needle is placed on the record. Instead of the spring 10, any other well known means may be employed to prevent falling out of the needle before it is clamped.

In the form of construction shown in Figs. 1 and 2, the needle-holder 3 is provided on one side with a longitudinal slot 11 for the lateral introduction of the needle. The needle 2 is here inserted parallel to its longitudinal axis into the bore 1 between the clamping places of the needle-holder 3. From Fig. 2 it can be seen that the needle lies in the clamping places of the needle holder, bounding the longitudinal slot 11 in such a manner that it cannot fall out side-

wise. The spring 10, which prevents the falling out of the needle in the direction of its axis, also prevents it from falling out laterally since it presses the needle against the clamping surfaces bounding the slot 11. The small bolt 12 (Fig. 2) bears the spring 10, and simultaneously serves as an abutment for the upper end of the needle. The bore for the bolt 12 is of importance in the formation of the bore for the needle, since the former limits the axial bore 1 which receives the needle 2. The needle 2 can be inserted by hand through the lateral slot 11. The insertion of the needle from the side is considerably more convenient than in the axial direction. It permits, in a practical and convenient manner, the insertion of the needles 2 by means of a mechanical device. For this purpose, in the device for changing the needles, the movable guide 13 for the slider 14 is provided with a longitudinal slot 15, in which a needle 2 can move transversely to the longitudinal direction of the slide. The longitudinal slot 15 is so arranged that it registers exactly with the slot 11 in the needle-holder 3, when the guide 13 is pushed up thereto. The slide 14 likewise moves in the slot 15 of the guide 13. It serves for feeding the needle lying in the guide 13 to the lateral slot 11 in the needle-holder 3. The slot 15 in the guide 13 is normally closed by a detent spring 16 in such a manner that the needle 2 falling through a slot 17 in the guide 13 out of a needle-magazine 22 into the longitudinal slot 15 is held against the front surface of the slide 14. By this means, further needles 2 are prevented from falling out of the magazine 22 through the slot 17 into the guide. A second needle 2 fills up the slot 17; it takes the place of the first needle after the latter has been inserted into the needle-holder 3, Fig. 5. A handle 18 is fixed in the slide 14. In the motion of the slide 14, the handle 18 takes with it the guide 13 by means of the tension of a spring 19 mounted on the guide, until the stop 20 thereof abuts against the frame 21 of the slide-device and of the needle magazine 22. Instead of the fixed stop 20, a stop 24 which is adjustable as desired by means of a screw 23 or the like, can be employed. This adjustable stop is formed by the head 24 of the screw 23 for example. The screw-head 24 abuts against the end 25 of the base-frame 29 as soon as the movable guide 13 has bridged over the space between the needle-changer and the needle-holder. A set-screw 27 in the bearing standard 28 of the screw 23 serves to secure it in position after it has been adjusted. The guide 13 is guided on a base-plate 29 by means of the overlapping pieces 30. A spring 31, which engages with the handle 18 and the base-plate 29, returns the slide 14 and the guide 13 to their initial

positions, acting in conjunction with the spring 19. On the side of the base-plate 29 is mounted a vertically arranged plate 32 which bears the magazine 22. This consists of a sheet-metal frame 33 with flanges 34, which grasp the vertical plate 32. A fastening device 34 serves for securing the magazine 22 to the plate 32. The front wall 35 of the magazine, which is fixed to the cover 36, is detachably connected to the frame 33, so that the magazine 22 can be conveniently filled with needles when its outlet opening 37 is closed by a sliding shutter 38. The latter is provided at its front end-piece 39 with a hole 40 which, by the application of a lead seal, serves for protecting the filled magazine from being opened by unauthorized persons. A weight 41 rests loosely in the magazine 22 and presses on the needles 2 in the magazine and the needles 2 are fed thereby with certainty to the outlet-opening 37. The magazine 22 presents the advantage that it can also serve as a storage-receptacle for the needles 2 instead of the needle-case otherwise usually employed.

An adjustable stop for the sound-box 8 is fixed on the sound-box-arm as shown in Fig. 4; this stop consists of a screw 42 with head and locknut. By means of this stop 42, the position of the swung up sound-box can be adjusted in such a manner that the slot 15 of the guide 13 and the longitudinal slot 11 of the needle-holder 3 can register exactly with each other.

An advantage of the transverse insertion of the needles consists in that both the needle-changing device and also the magazine and adjustable stop 42 can be mounted on the box 43 of the talking machine (see Figs. 10 and 11) or on the sound-box-arm 6 (see Figs. 3 and 4) and thus do not load the sound-box 8.

In the form of construction shown in Figs. 3 and 4, a carrier-plate 45 is secured to the arm 6 by means of a strap 44. On the carrier plate 45, in addition to the needle-changer 13, 14 and the magazine 22, there is mounted the adjustable stop 42. In the form of construction shown in Figs. 10 and 11, the needle-changer, magazine and adjustable stop are fixed to a stand 46 which, by means of a base-plate 47, rests on the box 43 of the talking machine. The stand 46 directly supports the base-plate 29 of the needle-changer. On the stand 46 is fixed an arm 47 which, in addition to the adjustable stop 42, also bears a holding device 48 for the folded up sound-box 8. This holding device engages around the sound-box 8 (see Fig. 11) and holds it fast by means of the spring-catch 49, so that it cannot be bent by the lateral pressure in the introduction of a new needle.

The needle-changer, in the form of con-

struction shown in Figs. 3 to 11, is operated by actuating the handle 18 after the sound-box 8 has been placed against the stop 42 and the used needle 2 has been ejected, by pressing it with the finger to one side, out of the slot 11 in the holder.

In the form of construction shown in Fig. 12, the needle-holder 50 is movably attached to the sound-box 51 by means of the flexible strip 52. The slot 53 for the introduction of the needles is extended through the whole needle-holder. In the slot are the grooves 54 for clamping the needles, while a spring 55 is arranged in such a manner that the needle in the slot 53 is pressed into a clamping groove 54. For this purpose, the spring 55 is rounded at the end turned toward the slot 53 so that the introduction of a new needle on one side of the slot 53 is facilitated and at the same time the ejection of the old needle on the other side of the slot 53 by spring pressure is permitted. As can be seen from Fig. 12, the needle is held obliquely in the clamping grooves 54 in the slot 53, in the operative position of the sound-box, by the weight of the latter, in which position the spring 55 is pressed back by the needle.

When the sound-box with the improved needle-holder is combined with a needle-changer 56, as shown in Figs. 21 to 25, the slide 57 of the needle-changer, which effects the introduction of the new and the changing of the old needle, must be so guided in the needle-changer 56 by means of the pin 58 and its forward motion must be limited in such a manner that the newly inserted needle is not pressed out beyond the correct normal position on the holder. On the slide 57, or on the pin 58, is mounted a handle 59 which for the purpose of moving the slide 57, is operated by hand, or, in automatic talking machines, by an arm moved by the driving gear. Spiral springs 60 and 61 connected to the pin 58 tend to hold the slide always in the position shown in Fig. 21. On the frame of the needle-changer 56 is detachably arranged the needle-magazine 62 with the needles 2. The guide 63, which is capable of being moved on the needle-changer frame and the slit 64 of which receives the needles 2 from the magazine 62 and holds them ready for the slide 57, by reason of the action of the spring 60, is carried along by the pin 58 of the slide 57, which pin is guided in the longitudinal slot 65 of the guide 63, until its adjustable stop-screw 66 abuts against the frame of the needle-changer and prevents further motion. This takes place when the guide 63 is brought up to the needle-holder 50 and the insertion of the needle by the slide 57 is to begin. The said slide is limited in its forward motion in that the pin 58 finally abuts against one end edge of the slot 65, so that the



new needle cannot be pushed out beyond its normal position in the holder. The rearward motion of the slide 57 and of the guide 63 is effected, after the insertion of the new 5 and the ejection of the old needle, by the spiral springs 60 and 61.

The sound-box 52, in the form of construction shown in Figs. 12 to 25, is also movably connected by the bent sound-box-arm 7 to the joint-piece 9 of the arm 6. A 10 carrier-arm 67 secured to the arm 6 bears both the needle-changer 56 and also the adjustable stop 68, against which the sound-box 52 can rest when in the position in 15 which it is raised from the plate 4 (see Fig. 25).

The various positions of the needles in the insertion and changing thereof by means of the slide 57 are given in Figs. 17 to 20. In 20 Fig. 17, a new needle 2 is in the guide 63 of the needle-changer 56 on the way to the needle holder 50, while the previously used needle 69 is still in the slot 53, *i. e.*, in the clamping grooves 54. The positions of the 25 slide 57 of the guide 63 and of the needles 2 correspond substantially to those shown in Fig. 22. The guide 63 is stopped in its further motion by the striking of the screw 66 against the frame of the needle changer. In 30 the position shown in Fig. 18, the slide 57 is pushed farther forward and the needle 2 has entered into the slot 53 in such a manner that it touches the old needle 69; the movable guide 63 is held fast as shown in Figs. 35 17 and 22. If now, according to Fig. 19, the forward motion of the slide 57 is continued, the fresh needle 2 forces the needle 69 out of the clamping grooves 54 at the same time overcoming the pressure of the spring 55. 40 As shown in Fig. 20, the new needle 2 then enters the place of the old needle 69 and the spring 55 flying back into the position shown in Fig. 17 causes the used needle 69 to be 45 ejected from the slot 53 with a certain amount of force. Thereupon the return of the slide 57 and of the guide 63 takes place by means of the springs 60, 61. The needle-holder provided with two slots is of special 50 importance for automatic talking machines with automatic mechanism for changing the plates. For talking machines of this kind, it is necessary that the insertion and ejection of the needles shall take place automatically. It is important that the needle 55 shall be capable of being easily changed. The falling out of the needle can also be temporarily prevented by a recess turned in the needle 2 or by thickening the end of the needle.

60 The construction of the needle-changer in its details can be varied as desired, similarly that of the needle-magazine. It is however always of importance that the outlet-openings of the magazine, the transverse slot 65 and the longitudinal slot of the slider-guide

shall be so arranged that the needle is moved parallel to its longitudinal direction as it is fed to the needle-holder.

The needle-holder can be mounted in any desired manner, either as in Figs. 1 and 2, 70 or as in Fig. 12. It is however important that the needle-holder shall always be provided with a lateral longitudinal slot for the lateral insertion of the needle.

The invention is not limited to the combination of the needle-changer with a peculiar 75 construction of needle-holder, since it is possible to provide a needle-holder having any other means therein for securing the needle.

Having described my invention, what I 80 claim and desire to secure by Letters Patent is:—

1. The combination with a sound box, of a talking machine, of a stylus bar provided with a socket for supporting a needle therein, one wall of said socket being provided 85 with a slot of less width than the corresponding width of the socket and normally wide enough to permit the insertion and removal of a needle laterally therethrough.

2. The combination with the sound-box of a talking machine, of a needle-holder having oppositely-arranged clamping means for 90 securing the needle and a lateral slot for the lateral insertion of the needle between said clamping means, and a spring arranged on the needle-holder near the slot for pressing the needle into the clamping means.

3. A sound box for talking machines comprising a stylus bar having a socket for 100 holding a stylus and a slot of less width than said socket and extending longitudinally thereof for permitting the lateral insertion and removal of a stylus, and yielding means arranged to engage said stylus outside of said socket for holding said stylus 105 in operative position.

4. A sound box for talking machines, comprising a needle holder socketed at one end, a spring located exteriorly of the socket and acting in a line normal thereto, and a needle 110 movable laterally into and out of the said socket in opposition to the said spring.

5. A sound box for talking machines, comprising a needle holder socketed at one end, a spring located outside of said socket and extending across the open end thereof, and a needle movable laterally into and out of 115 said socket in opposition to the said spring.

6. A sound box for talking machines, comprising a socketed needle holder, a spring arranged on the exterior of the socket and controlling the entrance to the same, and a stylus movable laterally into and out of the 120 said socket in opposition to the said spring.

7. A stylus bar provided with oppositely disposed walls for holding a stylus, and means external to said bar arranged to hold a stylus obliquely in position between and 125 against said walls.

8. The combination with a stylus bar having a stylus socket, of a stylus laterally movable with respect to said bar into said socket, and yielding means to hold said stylus with its longitudinal axis oblique to the longitudinal axis of said socket.

9. The combination with a stylus bar, having a stylus socket polygonal in a section perpendicular to the longitudinal axis of the socket, and a slot for the lateral insertion of a stylus, of a stylus insertible laterally into said socket through said slot and movable laterally in said socket with respect to said bar, and means arranged to hold said stylus with its longitudinal axis oblique to the longitudinal axis of said socket.

10. The combination with a stylus bar having a stylus socket and a lateral slot for the lateral insertion of a stylus into said socket, of a spring secured to said bar and normally overlapping the end of said socket and adapted to engage a stylus to hold the stylus in position.

11. In a talking machine the combination with a swinging sound box, of needle changing mechanism for said sound box for automatically inserting a needle laterally into said sound box and for simultaneously ejecting one therefrom.

12. In a talking machine, the combination with a needle holder, of means for inserting a needle laterally into said holder.

13. The combination with a sound box of a talking machine, of a needle holder having means for permitting the lateral insertion and removal of a needle, and means separated from said sound box for supporting a plurality of needles near said needle holder, and arranged to insert and remove needles respectively into and from said holder.

14. The combination with the sound-box of a talking machine, of a needle-holder having a lateral slot and clamping means, and a device for inserting a needle laterally into said slot in a direction at right angles to the longitudinal axis of the needle.

15. The combination with the sound-box of a talking machine, of a needle-holder having a lateral slot for the lateral insertion of the needle, oppositely arranged clamping means in said needle-holder, means for retaining said needle in said holder, a needle-receptacle, and a slide-device for moving the needle at right angles to its longitudinal axis out of the needle-receptacle into the said slot.

16. The combination with the sound-box of a talking machine, of a needle-holder having a lateral slot for the lateral insertion of the needle, oppositely-arranged clamping means in said needle-holder, a spring for holding a needle in said clamping means, a needle-receptacle, a movable guide and a slide in said guide for moving said needle at

right angles to its longitudinal axis into said slot.

17. The combination with the sound-box of a talking machine, of a needle-holder having oppositely-arranged clamping means and a lateral slot between said clamping means, a spring for holding a needle in said clamping means, a needle-receptacle a movable guide, a slide sliding in said guide and moving the needle in a direction at right angles to its longitudinal axis into the lateral slot in said needle-holder, and means for adjusting the guide to the slot in the needle-holder before the slide moves the needle forward.

18. The combination with the sound-box of a talking machine, of a needle-holder having a lateral slot and oppositely-arranged clamping means, a spring for retaining a needle in said clamping means, a needle-receptacle, a movable guide, a slide in said guide for moving a needle at right angles to its longitudinal axis into the lateral slot in said needle-holder, means for moving said guide and said slide, a frame supporting said guide and said slide, and a stop for co-acting with said frame to limit the travel of said guide.

19. The combination with the sound-box of a talking machine, of a needle-holder having a lateral slot and oppositely-arranged clamping surfaces, a spring for retaining a needle in said clamping means, a movable guide, a slide in said guide for moving a needle at right angles to its longitudinal axis into the lateral slot in said needle-holder, a frame supporting said guide and said slide, means for moving said guide and said slide, and an adjustable set-screw for coacting with said frame to limit the travel of said guide.

20. The combination with the sound-box of a talking machine, of a needle-holder having a lateral slot and oppositely arranged clamping surfaces, a spring for retaining a needle in said clamping means, a movable guide, a slide in said guide for moving a needle at right angles to its longitudinal axis into the lateral slot in said needle-holder, means for moving said guide, in advance of said slide, and means arranged therein for retaining a needle in said guide.

21. The combination with the sound box of a talking machine, of a needle-holder having a lateral slot and clamping means, a pivotal arm supporting said sound-box, a needle-changing device, and an arm secured to said first-named arm and independent of said sound-box for supporting said needle-changing device.

22. The combination with the sound box of a talking machine, of a needle-holder having a lateral slot and clamping means, a pivotal arm supporting said sound-box so as to enable it to swing up and down, a



needle-changing device, and an independent support for said needle-changing device arranged in such a position that the outlet of the needle-changing device registers with the lateral slot in the needle-holder when the sound-box is swung up.

23. The combination with the sound-box of a talking machine, of a needle-holder having a lateral slot and clamping means, and means mounted on the talking machine for ejecting a used needle through the said lateral slot.

24. A needle-holder for the sound-box of a talking machine, said needle-holder having two oppositely-arranged clamping surfaces for securing the needle, two oppositely-arranged longitudinal slots for the simultaneous insertion and removal of needles moving at right angles to their longitudinal axes, and a spring which holds the needle in its normal position and is rounded at the end opposite the opening of the needle-holder so as to facilitate the ejection of the used needle.

25. A needle-holder for the sound-box of a talking machine, said needle-holder having oppositely-arranged clamping surfaces for holding the needle and two oppositely-arranged longitudinal slots for the simultaneous lateral insertion and removal of needles, in combination with a needle-changing device comprising a needle-receptacle, a guide, a slide, and means for limiting the forward travel of said slide.

26. A needle-holder for the sound-box of a talking machine, said needle-holder having clamping means for holding the needle and a longitudinal slot for the lateral insertion of the needle, in combination with a needle-changing device having a needle-receptacle detachably secured thereto.

27. A sound-box for talking machines, comprising a needle-holder having means for securing a needle therein, in combination with a needle magazine, and means for feeding a needle from said magazine and inserting it laterally into said holder.

28. A sound-box for talking machines, comprising a needle-holder having means for securing a needle therein, in combination with a needle magazine, and means for removing a needle laterally from said holder and replacing the same by a needle from said magazine.

29. In a talking machine the combination with a laterally swinging arm, of a sound box supported thereby and a stylus bar provided with a needle-holder, a magazine for new needles detached from said sound box, and means to eject a worn needle from said needle holder and to replace it with a new needle from said receptacle.

30. The combination with a stylus bar having means for holding a stylus in posi-

tion, of a slider for inserting the stylus laterally into said position.

31. The combination with a stylus bar having means for holding a stylus in position, of a movable guide for a stylus, and means movable with respect to said guide for inserting a stylus laterally through said guide and into position to be held by said stylus bar.

32. The combination with a stylus bar having means for holding a stylus, of a movable guide, a slide carried by said guide and movable with respect thereto, and means for moving the guide toward the stylus bar and then moving the slide with respect to the guide to insert a needle into position to be held by the stylus bar.

33. The combination with a stylus bar having means for holding a stylus, of a movable guide, a slide carried by said guide and movable with respect thereto, and means for moving the guide toward the stylus bar and then moving the slide with respect to the guide to insert a needle into position to be held by the stylus bar, said means being controlled by a single handle.

34. The combination with a stylus bar having means for holding a stylus, of a movable guide, a slide carried by said guide and movable with respect thereto, and means for moving the guide toward the stylus bar and then moving the slide with respect to the guide to insert a needle into position to be held by the stylus bar, said means comprising a stop for limiting the travel of the guide.

35. The combination with a stylus bar having means for holding the stylus, of a guide, means for holding a stylus in said guide, and means for moving the stylus laterally from the guide into position to be held by the stylus bar.

36. The combination with a stylus bar having means for holding a stylus, of a movable guide, yielding means for holding a stylus in said guide, and a slider carried by said guide and movable with respect thereto for moving the stylus laterally from the guide to the stylus bar.

37. In a talking machine the combination with a movable arm, of a sound box carried thereby and movable with respect thereto, and having a stylus bar provided with means for holding a stylus, and a stylus magazine carried by said arm independent of said sound box.

38. In a talking machine the combination with a movable arm, of a sound box carried thereby and movable with respect thereto, and having a stylus bar provided with means for holding a stylus, a stylus magazine carried by said arm independent of said sound box, and means to move a stylus from said magazine toward said stylus bar.

39. In a talking machine the combination with a movable arm, of a sound box pivoted to said arm and having a stylus bar, a stylus magazine fixed upon said arm, and means to  
5 move a stylus from said magazine toward said stylus bar.

40. In a talking machine the combination with a movable arm, of an arm pivoted thereto, a sound box carried by said second  
10 mentioned arm, and a stylus magazine fixed with respect to said first mentioned arm.

41. In a talking machine the combination with a movable arm, of an arm pivoted thereto, a sound box carried by said second  
15 mentioned arm, a stylus magazine fixed with respect to said first mentioned arm, and means carried by said first mentioned arm for transferring a stylus from said magazine toward said sound box.

20 42. In a talking machine the combination with an invertible sound box, of stylus changing mechanism located in operative position with respect to said sound box when said sound box is in its inverted position.

25 43. The combination with a stylus bar, of stylus changing mechanism comprising a stylus magazine, and means for transferring a stylus from said magazine toward said stylus bar, said means comprising a movable  
30 guide for a stylus, a member movable in said guide for ejecting a stylus therefrom, a

fixed support for said guide, a yielding connection between said guide and said support, and a yielding connection between said guide and said movable member.

35

44. The combination with a stylus bar, of stylus changing mechanism comprising a stylus magazine, and means for transferring a stylus from said magazine toward said stylus bar, said means comprising a movable  
40 guide for a stylus, a member movable in said guide for ejecting a stylus therefrom, a fixed support for said guide, a yielding connection between said guide and said support, a yielding connection between said guide and  
45 said movable member, and a stop on said guide to limit the movement thereof.

45. The combination with a stylus bar, of a stylus changing mechanism comprising a stylus guide, a slide movable in said guide,  
50 and a spring connected to said guide and normally extending into the path of said slide for holding a stylus opposite the end of said slide.

In testimony whereof I have hereunto set  
55 my hand in presence of two subscribing witnesses.

CLARENCE VOGT.

Witnesses:

WOLDEMAR HAUPT,

HERMANN RASELOWSKY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."







H. RINGEL.  
 PHONOGRAPH FOR DOLLS OR OTHER TOYS.  
 APPLICATION FILED FEB. 12, 1910.

1,015,587.

Patented Jan. 23, 1912.

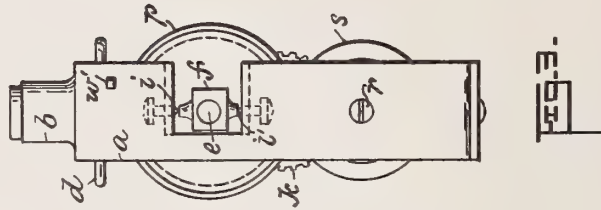


Fig. 1.

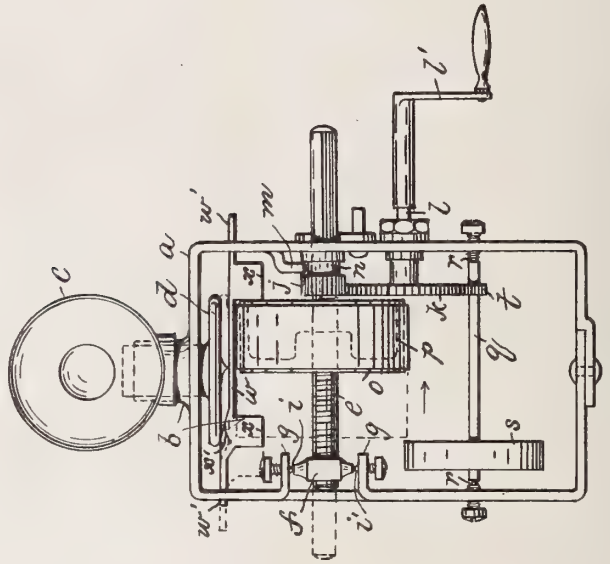
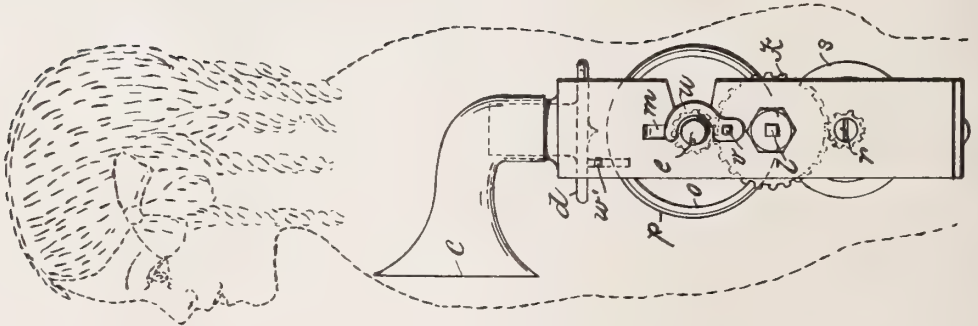


Fig. 2.



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# UNITED STATES PATENT OFFICE.

HERMAN RINGEL, OF NEWARK, NEW JERSEY.

PHONOGRAPH FOR DOLLS OR OTHER TOYS.

1,015,587.

Specification of Letters Patent.

Patented Jan. 23, 1912.

Application filed February 12, 1910. Serial No. 543,431.

*To all whom it may concern:*

Be it known that I, HERMAN RINGEL, a citizen of the United States, residing in the city of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographs for Dolls or other Toys, of which the following is a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make, construct, and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, forming a part of this specification.

My invention relates more especially to phonographs designed to be placed in dolls or other toys, whereby it can be constructed in a manner so simple and inexpensive, as to be adapted to almost universal use in the production of articulate sounds, and especially short sentences or phrases of everyday speech.

The object I have in view is to produce a simple, cheap and efficient construction, and my invention consists in the various novel devices and combinations as more fully hereinafter explained and pointed out by the claims.

In the accompanying drawings, Figure 1 is a side elevation of my improved phonograph, showing the same in position in a dotted view of a doll. Fig. 2 is a front view of the phonograph; and Fig. 3 is another side view of the same.

Similar letters of reference refer to like parts throughout the specification and drawings.

In the drawings, *a* represents a metal strap bent to form a rectangular supporting frame and provided at its top with a tubular extension *b* for the reception of the horn *c*, and the reproducer *d*.

*e* is the operating shaft screw-threaded, one end of which passes through the pivotally arranged nut *f*, which is pivotally mounted in the rectangular flanges *g* formed integral with the supporting frame *a*. The lower end of the nut *f* rests against a centering point *i'* in the lower flange *g*, and the other end of the nut rests against a centering point *i* passing through the upper flange *g* of the frame. A gear wheel *j* is mounted upon the operating shaft *e* and meshes with a gear wheel *k* which is secured to the han-

dle-shaft *l*. The handle shaft carrying the gear wheel *k* is directly journaled in one side of the frame *a* and has secured to it the handle *l'*. The gear wheel *j* is splined to the shaft *e* and held in position against the frame *a* by means of the tongue *m*, which is formed integral with the frame *a*, the end of which is in engagement with a groove *n* formed on said gear. Upon the shaft *e* is mounted a mandrel *o*, which carries the sound record *p*. A countershaft *q* extends across between the side pieces of the frame *a* beneath the shaft *e*, both ends of which set against the centering points *r*. The shaft *q* carries a balance wheel *s* on one end, while near its other end, it carries a gear wheel *t* which meshes with the gear wheel *k*, thus connecting shafts *q* and *e* together, so that the balance wheel *s* will steady the revolving movement of the shaft *e*.

To provide for the removal of the sound record *p* from the supporting frame *a*, the side piece of the frame *a* through which the shaft *e* passes, is slotted on one side, and the shaft is swung laterally into this slot, it being held by a pivoted locking lever *u*, which is pivoted at the point *v* to the side piece of the frame.

The means employed for disengaging the reproducing point from the record while the record is moved back to the position of starting, consist essentially of a loosely mounted sliding bar *w* preferably square in cross-section, the ends *w'* of which pass through and slide in correspondingly formed square apertures located in the upper ends of the side pieces of the supporting frame *a*. This sliding bar *w* is provided on its lower edge with depending wings or lugs *x*, the inner edges of which are designed to engage with the inner and outer edges of the mandrel *o* and to be moved by said mandrel.

The upper left hand end of the sliding bar *w* is provided with a beveled portion, as at *x'*, designed to engage with the edge of the reproducer *d* and to lift the same, thereby disengaging the reproducing point from the record, and this is accomplished when the right hand edge of the mandrel *o* engages the inner edge of the right hand depending wing or lug *x* of the sliding bar *w*, and forces said bar toward the right hand end of the frame *a*. The tubular stem of the reproducer *d* is loosely located in the tubular



extension *b* of the supporting frame *a* and the reproducing point rests by gravity upon the sound record *p*.

To operate the instrument, the parts, namely, the shaft *e* and mandrel *o* being in the position shown in dotted lines in Fig. 2, the handle *l'* is turned, revolving the sound record *p* beneath the reproducing point and at the same time advancing the sound record in the direction of the arrow and to the position shown in full lines, by reason of engagement of the shaft *e* with the pivotally arranged nut *f*. In this traveling movement of the record *p* which is secured to the mandrel *o*, the right hand end of the mandrel will engage with the inner end of the right hand wing *x* of the sliding bar *w* and will force the bar toward the right, causing the edge of the reproducer *d* to engage with the beveled portion *x'* of the upper edge of the bar *w*, thereby disengaging the reproducing point from the record. To carry the sound record back to the point of starting, so that it can be again reproduced, the handle *l'* is turned in the opposite direction, whereupon, the left hand end of the mandrel *o* engages with the inner edge of the left hand wing *x* of the sliding bar *w* which forces the bar toward the left hand end of the frame and permits the reproducer *d* to ride down on the beveled portion of the upper edge of the bar *w*, when the parts are again in the position shown in Fig. 1.

To provide for the removal of the sound record, the latch *u* is moved in a horizontal position and away from the operating shaft *e*, thus permitting said shaft to be swung around the pivoted nut *f* and out of the frame, thereby providing ready means for putting a new record on the mandrel without entirely removing the shaft *e* from the frame *a*. An opening in the body of the doll in juxtaposition to the phonograph which can be closed by a suitable door or cover, will serve the purpose of gaining access to the operating mechanism of the apparatus.

The construction of the phonograph described in this specification was devised for use in a doll or other image; but, as will be readily understood, the same apparatus may be used in a box or case of any form desired, and that many variations in the specific form and construction of the several parts may be made without departing from the spirit of the invention.

I claim:

1. In a phonograph, the combination with a supporting frame, a loosely mounted reproducer mounted in the upper part of said supporting frame, of a longitudinally moving operating shaft, a mandrel rigidly secured to said shaft and rotating therewith, and a stationary pivotally supported feed nut, said feed nut being located in the supporting frame for advancing the operating

shaft, said shaft being centered by said nut, so that by swinging it laterally it moves with said nut, and means slidably mounted in the upper end of the supporting frame adapted to be acted upon by the sides of the mandrel and to act upon the under side of the reproducer for disengaging the reproducing point from the record while the record is being turned back to the position of starting.

2. In a phonograph, the combination with a reproducer, an operating shaft, mechanism operatively connected with said operating shaft for advancing it, a pivotally supported feed nut for advancing the operating shaft, said shaft being centered by said feed nut, so that by swinging it laterally it moves with said nut and means slidably mounted in the upper end of the supporting frame adapted to act on the under side of the reproducer for disengaging the reproducing point from the record while the record is being turned back to the position of starting.

3. In a phonograph, the combination with a supporting frame, of a pivotally arranged feed nut located in one side of said supporting frame, an operating shaft being centered at one end by said feed nut, and held in a slot in the frame at the other end, so that by swinging it laterally it moves with the said nut, mechanism operatively connected with said operating shaft for advancing it, and a loosely mounted reproducer mounted in the upper end of said supporting frame.

4. In a phonograph, the combination with a supporting frame, of a pivotally arranged feed nut located in one side of said supporting frame, an operating shaft being centered at one end by said feed nut, and held in a slot in the frame at the other end, so that by swinging it laterally it moves with the said nut, mechanism operatively connected with said operating shaft for advancing it, a loosely mounted reproducer mounted in the upper end of said supporting frame and means yieldingly supported in the upper part of said frame for disengaging the reproducing point from the record while the record is being turned back to the position of starting.

5. In a phonograph, the combination with a supporting frame provided with integral inwardly projecting flanges, a feed nut pivotally located between said flanges, an operating shaft passing through and being longitudinally moved by said nut and capable of being swung laterally with said nut, mechanism operatively connected with said operating shaft for advancing it, a loosely mounted reproducer mounted in the upper part of said supporting frame and a slide bar located in the upper part of said frame, the lower edge of said bar being provided

with depending lugs and the upper edge with a beveled portion for disengaging the reproducing point from the record while the record is being turned back to the position of starting.

5  
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15  
6. In a phonograph, the combination with a supporting frame provided with integral inwardly projecting flanges, a feed nut pivotally located between said flanges, an operating shaft passing through and being longitudinally moved by said nut and capable of being swung laterally with said nut, a gear wheel splined on the operating shaft and held in position by a tongue formed integral with the supporting frame, means secured to the frame and in engagement

with said gear wheel for advancing the operating shaft, a loosely mounted reproducer mounted in the upper part of said supporting frame and a slide bar located in the upper part of said frame, the lower edge of said bar being provided with depending lugs and the upper edge with a beveled portion for disengaging the reproducing point from the record while the record is being turned back to the position of starting.

This specification signed and witnessed this 11th day of February, 1910.

HERMAN RINGEL.

Witnesses:

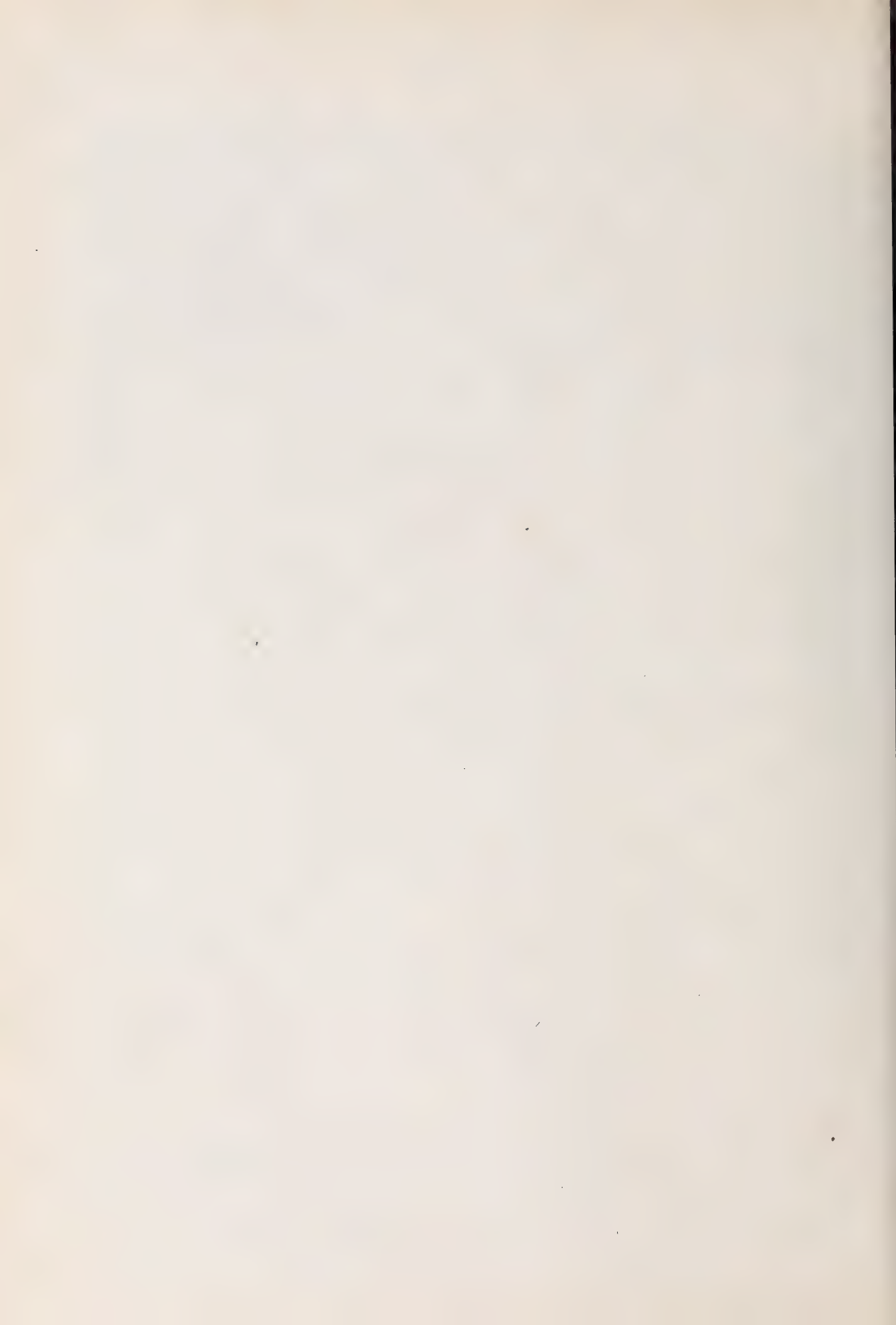
FREDK. C. FISCHER,  
C. A. ALLISTON.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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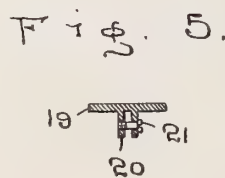
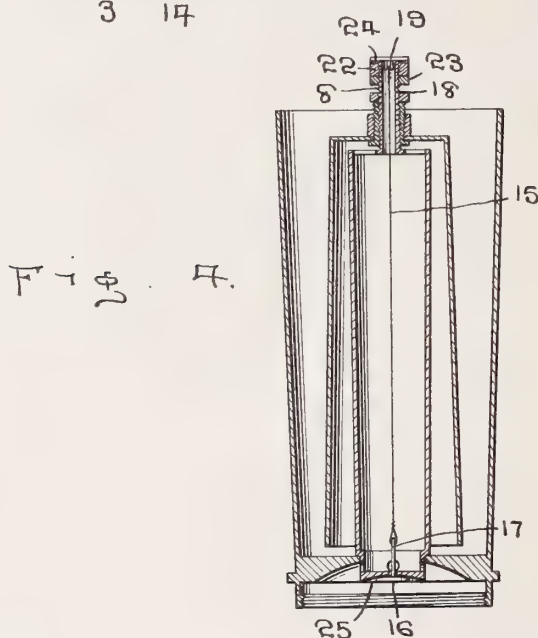
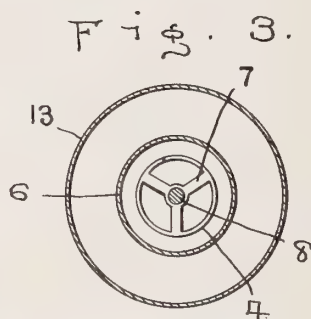
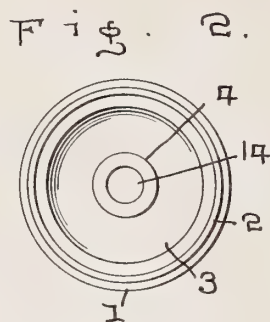
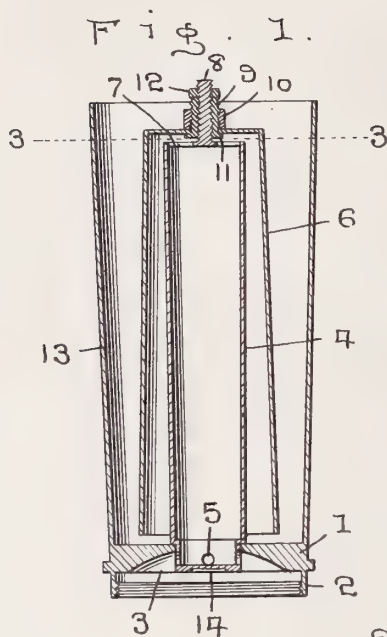




W. N. HUNTER.  
SOUND REPRODUCER FOR TALKING MACHINES, TELEPHONES, &c.  
APPLICATION FILED JUNE 16, 1910.

1,015,622.

Patented Jan. 23, 1912.



WITNESSES:

*Thos. Riley*  
*M. Newcomb.*

INVENTOR

W. N. Hunter

BY

*W. J. Fitzgerald*  
Attorneys

# UNITED STATES PATENT OFFICE.

WILLIAM N. HUNTER, OF BLANCHESTER, OHIO.

SOUND-REPRODUCER FOR TALKING-MACHINES, TELEPHONES, &c.

1,015,622.

Specification of Letters Patent.

Patented Jan. 23, 1912.

Application filed June 16, 1910. Serial No. 567,280.

*To all whom it may concern:*

Be it known that I, WILLIAM N. HUNTER, a citizen of the United States, residing at Blancheſter, in the county of Clinton and State of Ohio, have invented certain new and useful Improvements in Sound-Reproducers for Talking-Machines, Telephones, &c.; and I do hereby declare the following to be a full, clear, and exact description of the invention, ſuch as will enable others ſkilled in the art to which it appertains to make and uſe the ſame.

My invention relates to new and uſeful improvements in ſound reproducers for talking machines, telephones, etc., and is more particularly an improvement over my former Patent #875,352, iſſued December 31, 1907 and my object is to provide means in connection with a ſound receiving chamber for ſuppreſſing or eliminating all ſounds other than the pure and finer tones produced by the diaphragm.

A further object is to provide means for intensifying the tone ſound without affecting the quality of the tone.

A further object is to provide adjustable means for increaſing or decreaſing the intensity of the ſound.

A further object is to provide means for preventing outside diſturbances or noiſes from reaching the diaphragm, when the diaphragm is in uſe for reproducing purpoſes, and, a further object is to provide means for adjusting the tenſion on the ſound excluding or arreſting mechanism.

Other objects and advantages will be hereinafter referred to and more particularly pointed out in the ſpecification hereunto annexed.

In the accompanying drawings which are made a part of this application, Figure 1 is a vertical central ſectional view through the device removed from the diaphragm. Fig. 2 is a bottom plan view thereof. Fig. 3 is a ſectional view as ſeen on line 3—3 Fig. 1. Fig. 4 is a ſectional view ſimilar to Fig. 1, ſhowing a ſlightly modified form of device, and, Fig. 5 is a detail ſectional view of a diſk uſed in connection with the device ſhown in Fig. 4.

Referring to the drawings in which ſimilar reference numerals designate correſponding parts throughout the ſeveral views, 1 indicates a cap, which is conſtructed in the uſual or any preferred manner, the flange 2 thereon being adapted to receive

the uſual or any preferred form of diaphragm (not ſhown) and in the under face of the cap 1 is formed a cavity 3, which cavity is preferably dome-shaped and is adapted to gather the ſound produced by the needle of the diaphragm. It is cuſtomy in devices of this claſs to place the cap immediately back of the diaphragm and convey the ſounds through a central opening in the cap and directly into a horn or other device, but when ſo doing, the mechanical ſounds of the machine are fully reproduced and rendered audible, thus deſtroying the finer tones or ſounds. To overcome this objectionable feature, I provide means for eliminating all tones ſave the finer ſound vibrations by introducing centrally through the cap 1, a tube or ſimilar device 4, the inner end of which is extended through the cap to a point adjacent the diaphragm, when the cap is properly connected with the diaphragm. The inner end of the tube is cloſed and in order to admit the ſound waves into the tube, that portion of the wall of the tube projecting through the cap is provided with openings 5, preferably four in number, but if preferred, a greater or leſs number of the openings may be provided or an elongated ſlot ſubſtituted for the openings. The oppoſite end of the tube 4 is extended a diſtance from the cap and is left open, ſo that the ſound waves may eſcape therefrom and in order to increaſe the volume of the tone, a bell 6 is introduced over the tube 4, ſo as to carry the ſound waves back to a point adjacent the cap 1, before they are released into the horn or other device for receiving the ſame.

The tube 4 and bell 6 are preferably tapered outwardly from their cloſed ends, ſo that the ſound vibrations will more readily paſs through the ſame and as the cloſed end of the bell is oppoſed to the open end of the tube, the flares of the tube and bell will be in oppoſition to each other. In order to regulate the volume of ſound through the tube and bell, ſaid bell is adjustably mounted with reſpect to the tube by extending a ſpider 7 acroſs the open end of the tube and extending upwardly from the center thereof is a ſtud 8, which is exteriorly threaded and around ſaid ſtud is introduced a ſleeve 9, which is interiorly and exteriorly threaded, the interior threads engaging the threads of the ſtud, while the exterior threads are engaged by a nut 10, and



by means of which the bell is locked in engagement with the sleeve. The lower end of the sleeve is provided with a peripheral flange 11, upon which the bell rests, said flange fitting within the bell, while the nut 10 is placed on the opposite side of the bell, thereby locking the closed end of the bell between the flange and nut, when the nut is turned home on the sleeve. When increasing the volume of sound, the sleeve 9 is turned outwardly on the stud 8 and vice versa when the volume of sound is reduced, a locking nut 12 being introduced on to the free end of the stud, so that when the locking nut is turned against the end of the sleeve, said sleeve will be held in its adjusted position on the stud.

The cap 1 has attached thereto an elongated band 13, which is preferably formed integral with the cap, although the same may be formed separable, if desired. This band is arranged to receive the end of the usual form of horn or other device and is preferably flared from its inner to its outer end and as communication with the outside atmosphere is completely closed at the point of intersection of the band with the cap, the sound produced by the diaphragm will be greatly intensified when it reaches the horn.

In practice, it has been found that the finer tones are produced at a point farthest from the center of the diaphragm and in order to eliminate the harsh sounds produced by the needle at the center of the diaphragm, the closed end of the tube 4 is provided with a recess 14 and as said recess is immediately above the needle, the usual scratching or other sounds produced by the needle will be delayed by the recess, and reflected from the walls thereof to be commingled with and somewhat smothered by the more perfect and mellow tones which are passed through the openings in the tube and emitted from the horn attached thereto. The atmospheric pressure produced by the volume of air collected in the recess 14 will also serve to modify the vibration of the diaphragm and maintain a uniform vibration thereof.

As best shown in Fig. 4, I have also provided a slightly modified form of device which consists of extending a wire 15 lengthwise of the tube 4, the lower end of the wire being attached to a disk 16, the shank 17 of which projects through the closed end of the tube, while the opposite end of the wire enters a central opening 18, through the stud 8 and is attached to a disk 19 at the outer end of the stud. The disk 19 is provided with a pair of inwardly projecting ears 20, through which is entered a screw 21, around which the wire is attached, the outer end of the wire having a loop, through which the screw extends and by

attaching the outer end of the wire in this manner, it can be readily disengaged from between the ears, should it be desired to remove the bell from the tube. In order to increase or decrease the tension of the wire, a nut 22 is introduced around the stud 8 before the disk 19 is placed thereover and in addition to the nut 22, I provide a jam nut 23, the object of which is to hold the nut 22 against rotation, when said nut is properly set. The end of the opening through the stud is hermetically sealed by placing between the nut 22 and disk 19 a gasket or the like 24, which is preferably constructed of rubber, while a similar gasket 25 is placed between the disk 16 and end of the tube 4. The wire 15, when drawn reasonably tight, is adapted to be vibrated by and to a certain degree absorb the harsher and higher toned sounds. This action somewhat tones down the tube 4 and allows the softer sound waves to pass therethrough almost unmolested. In this instance, the face of the end section of the tube is formed concave, which serves to hold the sound waves produced at the center of the diaphragm. The gaskets 24 and 25 also prevent the sound waves from passing into the parts to which the wire is attached, thus eliminating any effect that an outside noise or jar might otherwise have upon the diaphragm. By this construction, it will be readily seen that none but the finer tones will be reproduced and that the intensity of the sound may be readily increased or decreased, as occasion may require. It will further be seen that in view of the simplicity of this device, it can be very cheaply constructed and can be readily attached and operated in connection with any form of sound producing device and it will likewise be seen that by placing the wire through the tube in the manner shown, any outside influences will be excluded from the diaphragm. It will also be understood that although I have shown but one wire, any number of wires may be used, as occasion may require.

What I claim is:—

1. In a sound reproducer, the combination with a cap, of a hollow member having one of its ends extended through the cap, said end being closed and the opposite end open, an additional hollow member extending over the first hollow member, means to adjust the second hollow member, the first hollow member having openings therein to admit sound from the cap and the closed end of said first hollow member having a recess therein.

2. In a sound reproducer, the combination with a cap, of a hollow member projecting through said cap, one end of the hollow member being closed and a stud at the opposite end thereof, a wire extending through the hollow member and stud, disks for se-

curing the ends of said wire in said hollow member, and means at the end of the stud to increase or decrease the tension of the wire.

5 3. In a sound reproducer, the combination with a hollow member having one of its ends closed and a stud at the opposite end of the hollow member, of a wire extending longi-  
10 tudinally through the hollow member and through the stud, a disk at each end of the wire to anchor said ends and means sur-  
rounding the stud adapted to direct pressure against one of the disks and regulate the tension of the wire.

15 4. In a sound reproducer, the combination with a hollow member having a closed end

and a stud at its opposite end, of a wire extending through the hollow member and through said stud, a disk at each end of the wire, to which the wire is secured, means to  
20 increase the tension of the wire and gaskets between the disks and parts with which they engage to prevent the vibration of the wire affecting said parts.

In testimony whereof I have signed my  
25 name to this specification in the presence of two subscribing witnesses.

WILLIAM N. HUNTER.

Witnesses:

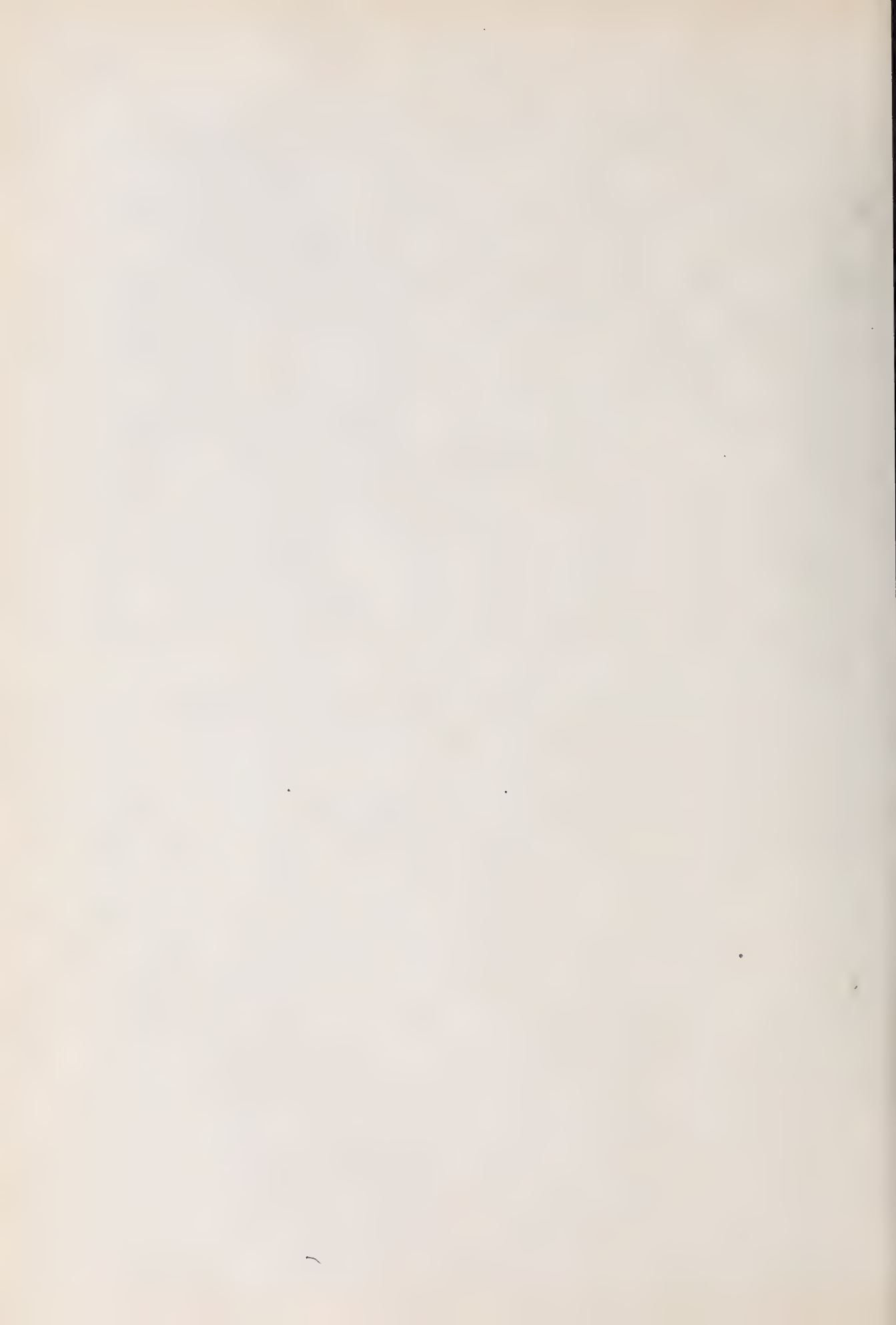
A. J. SAVAGE,

JOHN A. KELLY.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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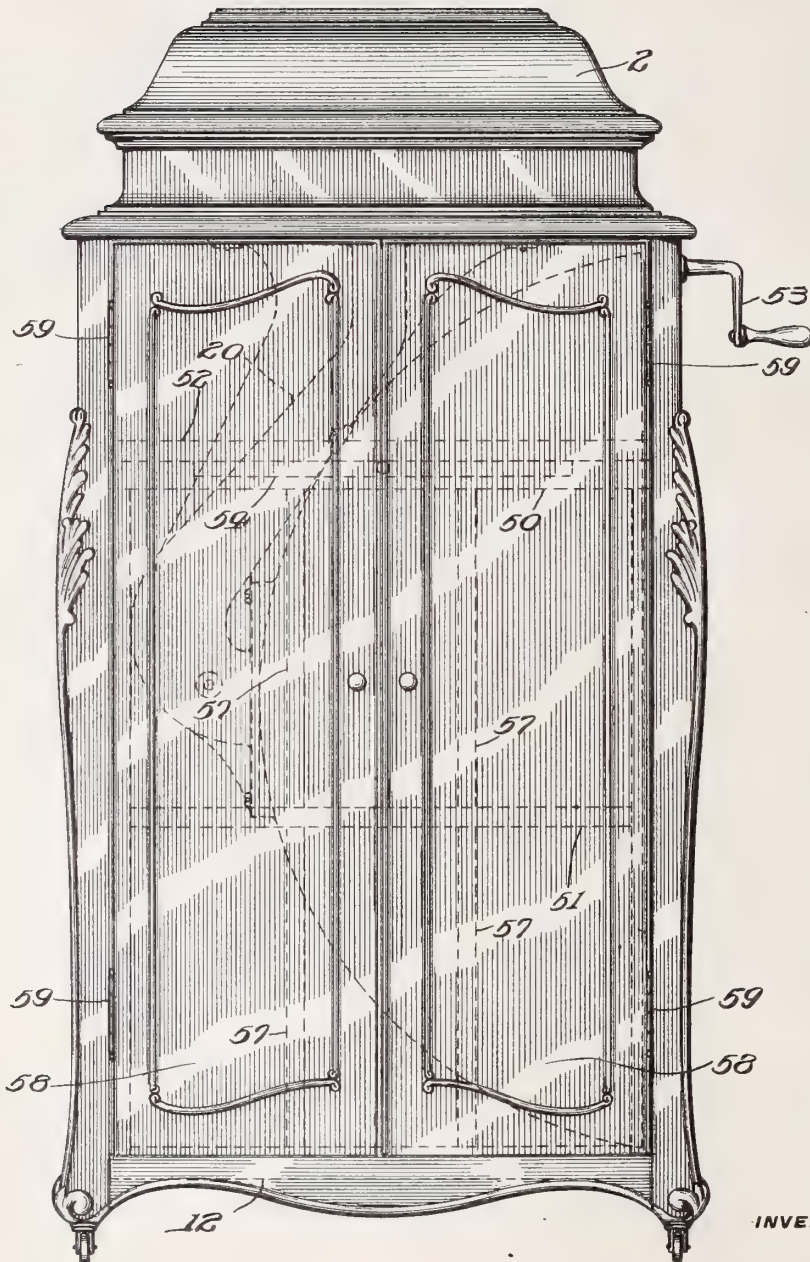
J. C. ENGLISH.  
TALKING MACHINE.  
APPLICATION FILED FEB. 20, 1909.

1,016,255.

Patented Feb. 6, 1912.

5 SHEETS—SHEET 1.

*Fig. 1.*



WITNESSES

*H. J. Hartman.*  
*A. J. Gardner.*

BY

*John C. English.*  
*George A. Patten*

ATTORNEY



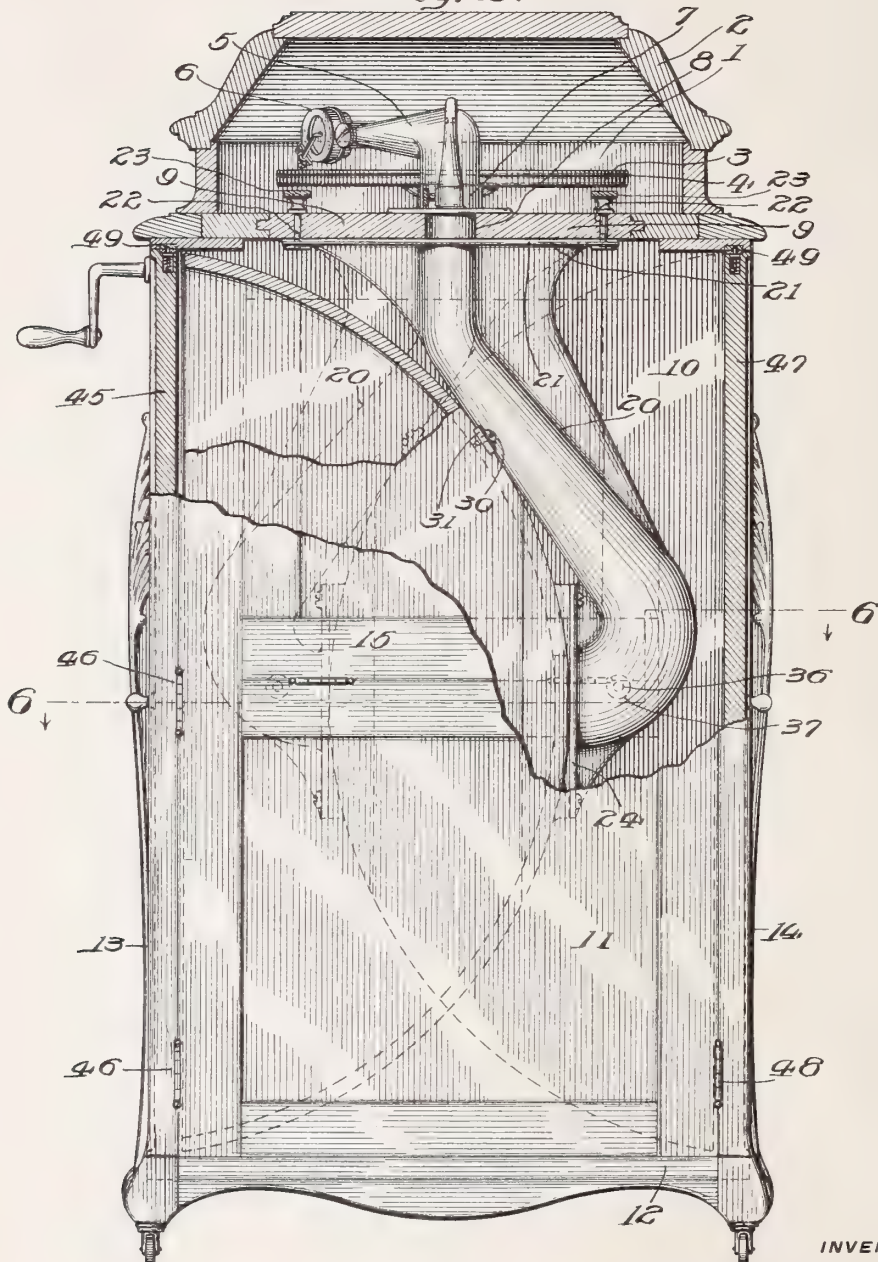
J. C. ENGLISH.  
TALKING MACHINE.  
APPLICATION FILED FEB. 20, 1909.

1,016,255.

Patented Feb. 6, 1912.

5 SHEETS—SHEET 2.

*Fig. 2.*



INVENTOR

*John C. English.*

BY

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ATTORNEY

WITNESSES

*W. J. Hartman.*

*W. J. Gardner.*



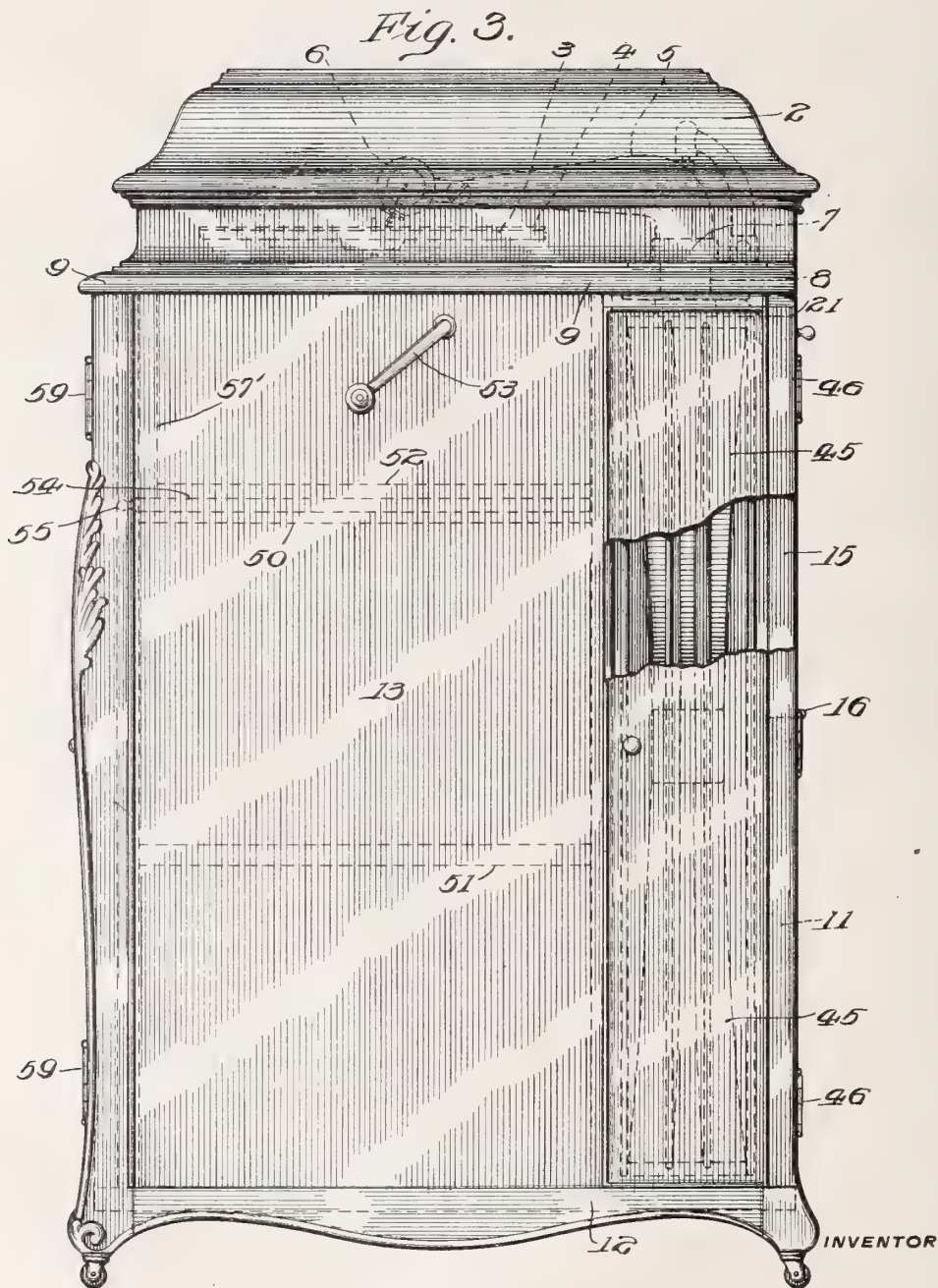


J. C. ENGLISH.  
TALKING MACHINE.  
APPLICATION FILED FEB. 20, 1909.

1,016,255.

Patented Feb. 6, 1912.

5 SHEETS—SHEET 3.



WITNESSES  
W. J. Hartman.  
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*Harold E. Pettit*  
ATTORNEY



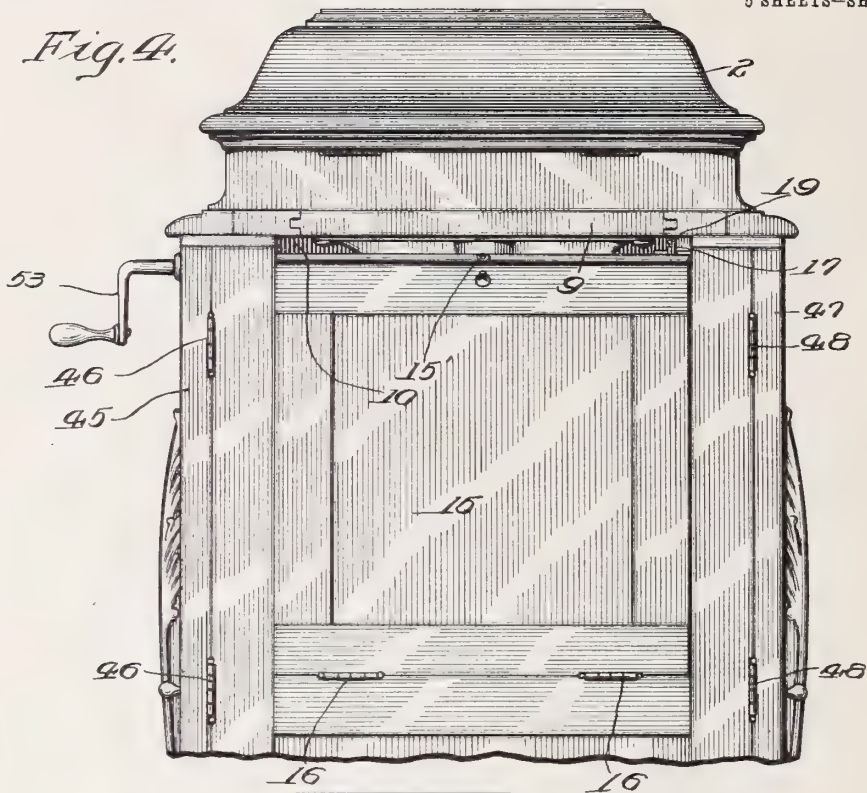
J. C. ENGLISH.  
TALKING MACHINE.  
APPLICATION FILED FEB. 20, 1909.

1,016,255.

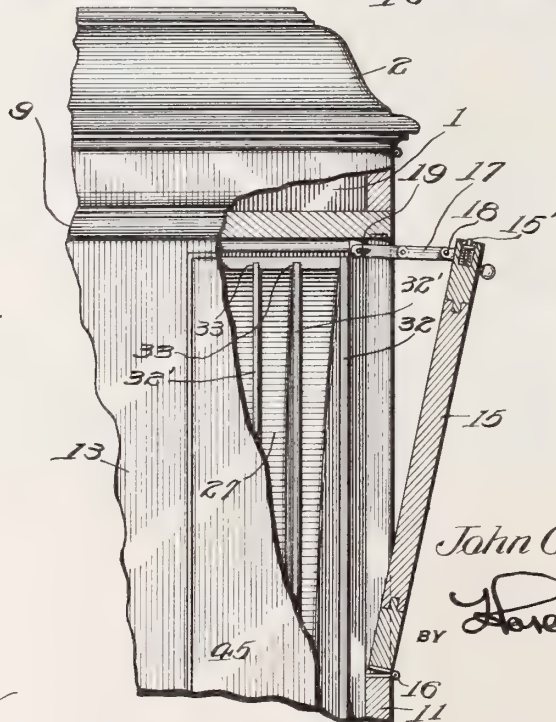
Patented Feb. 6, 1912.

5 SHEETS—SHEET 4.

*Fig. 4.*



*Fig. 5.*



WITNESSES  
*H. J. Hartman.*  
*A. J. Gardner.*

INVENTOR  
*John C. English.*

BY *Forace Pitt*

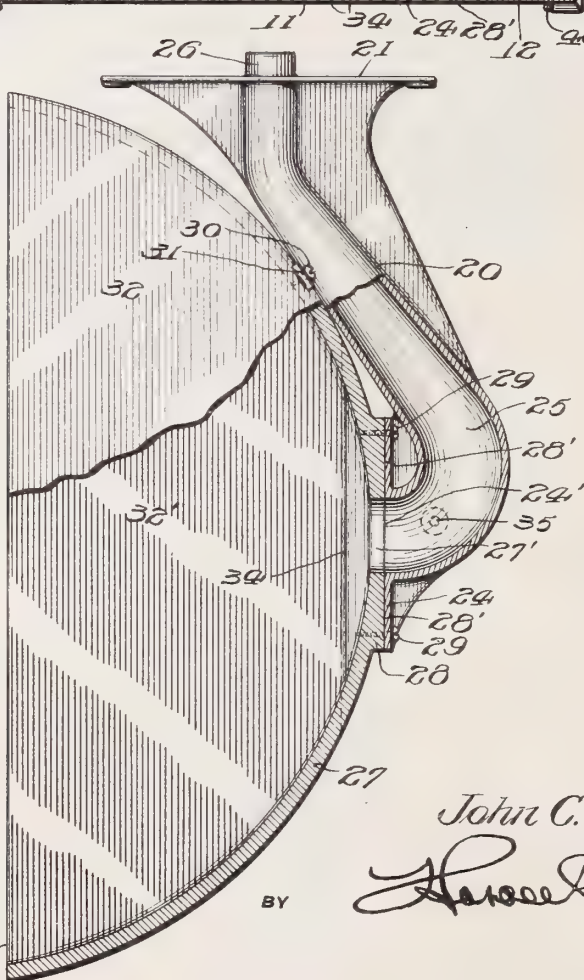
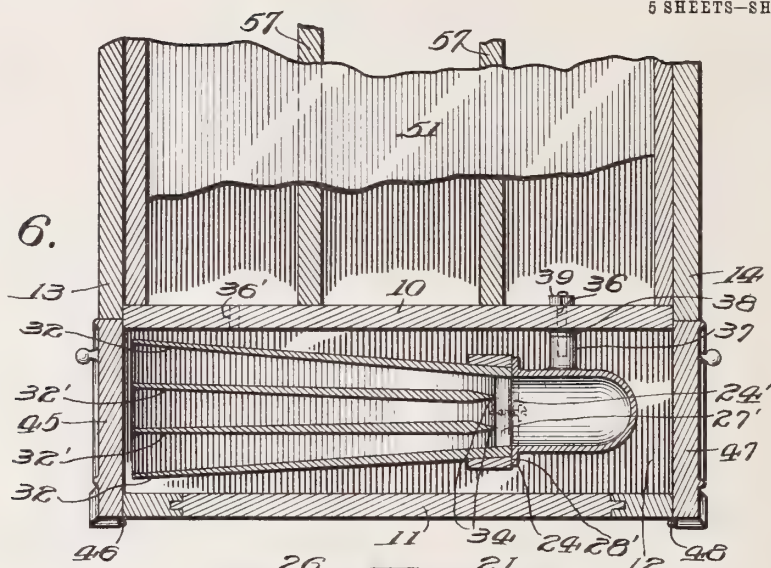
ATTORNEY





**1,016,255.**

5 SHEETS—SHEET 5.



27

INVENTOR

*John C. English*

*Harold Pettit*

ATTORNEY

# UNITED STATES PATENT OFFICE.

JOHN C. ENGLISH, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

TALKING-MACHINE.

1,016,255.

Specification of Letters Patent.

Patented Feb. 6, 1912.

Application filed February 20, 1909. Serial No. 479,105.

*To all whom it may concern:*

Be it known that I, JOHN C. ENGLISH, a citizen of the United States, and a resident of the city of Camden, county of Camden, and State of New Jersey, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

The main objects of this invention are to provide a talking machine having an inclosed cabinet provided with a plurality of openings, and an amplifier in the cabinet and adjustable to register with any one of said openings; to provide a talking machine inclosed in a cabinet having a sound outlet in one side thereof and which is adapted for convenient operation in a corner of a room or in a similar position; to provide a compact inclosed talking machine having a comparatively large storage space for records and comparatively large and efficient sound amplifying means; to provide a talking machine having a sound amplifier provided with an outlet in a casing, and in which means are provided to deflect the vibrations transmitted from the side of the amplifier upwardly or in a direction different from that in which the vibrations are delivered from the outlet of the amplifier; and to provide other improvements as will appear hereinafter.

In the accompanying drawings, Figure 1 is a front elevation of a talking machine constructed in accordance with this invention; Fig. 2 a rear elevation partly in section of the same; Fig. 3 a side elevation of the same partly broken away to show the amplifier; Figs. 4 and 5 a rear elevation and a fragmentary side elevation partly in section of the upper portion of the same, showing the rear door thereof open; Fig. 6 a fragmentary horizontal section on the line 6—6 of Fig. 2; and Fig. 7 a side elevation partly in section, of the amplifier.

Referring to the drawings, one embodiment of this invention comprises a substantially rectangular upright cabinet having a compartment 1 at the top, with a movable

cover 2 inclosing the usual turntable 3 adapted to carry a disk record 4, and a radial hollow sound conveying arm 5, carrying at its free end the usual sound reproducer 6 with which it communicates and opening downwardly through the hollow bracket 7 upon which it is pivoted, into an aperture 8 through the bottom wall 9 of the top compartment 1 through which it communicates with the amplifier. The amplifier or resonator is located in a compartment or inclosure in the rear portion of the cabinet between a vertical partition 10 and the back wall 11 of the cabinet and between the bottom wall 12 of the cabinet and the bottom wall 9 of the top compartment of the cabinet. The vertical partition 10 extends from the bottom 12 of the cabinet to the bottom of the top compartment containing the sound reproducer and is substantially parallel to the back of the cabinet, extending the full distance between the sides 13 and 14, of the cabinet. The greater part of the upper half of the back of the cabinet is in the form of a vertical door or closure 15 mounted at its lower edge upon hinges 16 to swing outwardly upon a horizontal axis whereby access may be had to the compartment containing the amplifier. The door may have a spring catch 15' at its upper edge to hold the door when closed.

A connection is provided between the upper portion of the door 15 and the fixed portion of the cabinet whereby the said door or closure may be held in an inclined position (as shown in Fig. 5), to deflect the sound waves produced by vibration of the rear side of the amplifier directly into the open air. This connection may be a pair of links 17 pivoted together end to end, one end of one link being pivoted at 18 to the upper portion of the door and the other link being provided near its free end with a recess in its lower edge engaging over a pin 19 rigid with the cabinet. When the door is closed, the links fold together and when it is desired to open the door wider than the links would allow, the inner link may be lifted from engagement with the pin 19.

The amplifier is supported by a rigid hol-



low bracket 20 depending in the cabinet and forming a part of the amplifier. This bracket has a base plate 21 integral therewith and having a flat horizontal upper surface which is rigidly secured to the under surface of the bottom 9 of the top compartment of the cabinet by means of the thumb screws 22 which have knurled heads 23 located in the top compartment, the screws extending through the bottom 9 into the base plate, whereby the bracket may be attached or detached from its support. The bracket is in the form of a goose neck extending longitudinally in a compound curve and terminates at its lower end in a substantially vertical plate 24 integral therewith and having a flat face for supporting the body of the amplifier. An aperture 25 substantially circular in cross section, extends longitudinally through the bracket, tapering upwardly and opening at its upper end through a tubular extension 26 of the bracket which fits in the aperture 8 in the bottom of the top compartment of the cabinet through which it communicates with the sound box. The longitudinal aperture through the bracket communicates at its lower end through a substantially rectangular opening 24' in the center of the flat supporting plate 24 with the body of the amplifier.

The body or main portion of the amplifier comprises a comparatively thick and rigid oblong member or supporting board 27, rectangular in transverse section and substantially curved longitudinally from end to end, and of substantially concavo-convex or other similar form. The member 27 is provided centrally with a substantially rectangular opening 27', and upon its rear side with a boss 28 surrounding the opening and having a flat side 28' secured rigidly against the flat side of the supporting plate 24 by means of screws 29, the central aperture 27' through the supporting board registering with the aperture 24' of the bracket. This board may be further secured to the bracket by means of a screw 30 passing through the lug 31 rigid with the bracket intermediate of its ends.

Secured upon opposite sides respectively of the curved supporting board 27 are a pair of vertical sounding boards 32, the rear edges of which are substantially convexly curved from end to end to conform to the shape of the rear surface of the supporting board 27, and the front edges of which are vertical and connect the ends of the curved support. These sounding boards preferably diverge slightly and are tapered in thickness toward the front of the amplifier so that each sounding board diminishes in thickness as it increases in width, thus making the boards more sensitive, to respond to, and to amplify sounds of various pitches.

The interior of the body of the amplifier may be divided by similar spaced vertical sounding boards 32' preferably slightly diverging and tapering outwardly, which are rigidly secured in grooves 33 provided therefor in the concave surface of the supporting board, the inner free ends of these sounding boards being tapered to form substantially sharp edges 34 to permit the free passage of the sound waves outwardly through the amplifier. The comparatively rigid curved board 27 acts not only as a support for the sounding boards but also as a deflector to throw the sound waves toward the mouth of the amplifier.

It is now evident that the amplifier is contained in a compartment separate from that containing the reproducer and separate and in the rear of the compartments for the storage of records and that the amplifier at its mouth is of substantially the same size as the compartment as to height and width. Substantially the whole compartment is filled by the amplifier but the amplifier is so arranged as not to contact with the side walls of the compartment at any point except where its rigid bracket 20 is hung or supported from the partition forming the bottom of the top compartment and at that point where the rigid bracket is attached to the vertical partition 10 by the bolt 36.

The sounding boards of the amplifier are supported entirely by the supporting board 27, and the said supporting board 27 is entirely supported by the flat surface of the rigid hollow bracket 20, the sounding-boards thus being held out of contact with any part of the cabinet or machine and being free to respond to the vibrations of the sound waves passing therethrough. The bracket 20 may be supported entirely from its base plate 21, but may be further secured by means of a bolt 36 which passes through the vertical partition 10 inclosing the amplifier and is mounted in a boss 37 provided therefor upon the side of the bracket adjacent its lower end, a washer 38 being interposed between the boss and the partition and the bolt having a nut 39 connecting the opposite sides of the partition whereby the bracket is rigidly clamped in position.

The mouth or free delivery end of the amplifier is oblong and vertically elongated in vertical transverse section and extends vertically for nearly the full distance between the bottom of the top compartment or the plane of the record support and the bottom of the cabinet, opening adjacent and in alinement with a rectangular oblong opening or aperture of greater height than width and of substantially the same area in the side of the cabinet, the opening being provided with a closure or door

mounted upon hinges 46 adjacent the corner of the cabinet to swing outwardly on a vertical axis. A similar aperture or opening having a door 47 mounted upon hinges 48 is provided upon the opposite side of the cabinet, the two doors being in alinement. These doors each may have a spring catch 49 to hold the doors when closed.

The amplifier may be reversed from the position shown in the full lines in Fig. 2 of the drawings to the position shown in dotted lines in the same figure, and when thus reversed the mouth of the amplifier is in alinement with the opening in the adjacent side of the cabinet, the amplifier being supported as before, solely from its base plate or with the additional support of the bolt 36 for which a suitable aperture 36' is provided in the vertical partition 10 to receive the same when the bracket is in its reversed position. This reversal of the amplifier is made possible by having the aperture in the upper end of the bracket and through the bottom of the top compartment of the cabinet midway between the sides of the cabinet and by having the attaching thumb screws located at equal distances from the central opening in the bracket and also by having the holes in the vertical partition 10 for the bolt 36 at the lower end of the bracket, spaced at equal distances from the opposite sides respectively of the cabinet.

The front portion of the cabinet below the top compartment 1 and between the vertical partition 10 and the front wall of the cabinet is divided into a plurality of compartments by means of horizontal partitions 50 and 51 spaced vertically, the upper one of which, 50, forms a support for the base 52 of the motor which actuates the turn-table of the machine. The motor not constituting in itself any part of this invention, is not shown, but it is contained in the compartment above the horizontal partition 50 and is operated by the crank 53 projecting from one side of the cabinet. The upper surface of the partition 50 is recessed centrally from front to back and for a greater part of its width to receive a flat board or shelf 54 which is slidably held in position and is normally concealed from view when the cabinet is closed, but which is provided on its front edge with a knob 55 whereby the board may be drawn forwardly to project partially out of its recess to form a convenient shelf for use during the operation of the machine. The front part of the compartment 56 containing the motor is inclosed by means of a vertical partition 57'. The compartments below the compartment containing the motor are divided by vertical partitions 57 to form convenient spaces for the storage of records. The front of the cabinet is provided with a pair of vertical doors 58 extending from the bottom of the

top compartment of the cabinet to the bottom of the cabinet and mounted upon hinges 59 secured to the opposite sides of the cabinet respectively.

While only a single form has been illustrated in which this invention may be embodied, it is obvious that the invention is not limited to this particular construction, but may be applied in various forms to meet various conditions without departing from the spirit of this invention or the scope of the appended claims.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States:—

1. In a talking machine, the combination with a cabinet having a plurality of openings therein, of an amplifier in said cabinet and adjustable to register with any one of said openings.

2. In a talking machine, the combination with a cabinet having an opening in each of two sides respectively thereof, of an amplifier adjustably fixed in said cabinet to register with either of said openings.

3. In a talking machine, the combination with a cabinet having a vertically elongated aperture in the side thereof, of an amplifier in said cabinet opening adjacent said aperture, said amplifier comprising comparatively rigid means forming the upper and lower edges thereof and vertical sounding-boards forming the sides thereof.

4. In a talking machine, the combination with a cabinet, of an amplifier depending from one end therein, said cabinet being provided with a plurality of openings spaced at substantially equal distances from said end of the amplifier, and means to secure the mouth of the amplifier rigidly adjacent any one of said openings.

5. In a talking machine, the combination with sound reproducing mechanism, of a sound amplifier comprising a plurality of vertical sounding-boards, each having one edge curved from end to end, rigidly secured in spaced relationship at said edges, and means for admitting sound waves between said boards, said boards diminishing in thickness outwardly from said edges respectively.

6. In a talking machine, the combination with a cabinet, of a hollow bracket rigidly secured thereto and terminating at one end in a flat support, and amplifying means secured to said support.

7. In a talking machine, the combination with a cabinet, of a hollow bracket rigidly secured at one end thereto, and terminating at its other end in a support, and a vertical sounding-board, having a substantially convex edge secured to said support at said edge.

8. In a talking machine, the combination with a cabinet, of a hollow bracket rigidly



secured at one end therein and terminating at its other end in a support, of a sounding-board having a substantially convex edge secured to said support at said edge, said sounding-board diminishing in thickness from said convex edge outwardly.

9. In a talking machine, the combination with a cabinet, of a sound amplifier therein comprising a pair of vertical sounding-boards each board having an edge substantially curved from end to end, a member secured rigidly between said curved edges forming a substantially concave surface between said sounding-boards, and means for admitting sound waves between said boards, said amplifier having an oblong mouth arranged with its longer diameter vertical.

10. In a talking machine, the combination with a cabinet having a plurality of openings in the sides thereof, of a horizontal partition adjacent the top thereof, a turntable supported above said partition, a sound box supported over said turntable, a vertical partition extending from said horizontal partition to the bottom of said cabinet and a vertically elongated amplifier arranged upon one side of said partition and extending substantially the full length of the partition, said amplifier being adjustably directed toward any one of said openings.

11. A talking machine comprising sound reproducing means, a cabinet provided with a plurality of openings therein, sound amplifying means in said cabinet and having a single outlet only, said amplifying means being adjustable to communicate with said sound reproducing means and to deliver said sound waves through said outlet toward any one of said openings.

12. A talking machine comprising sound reproducing means, a cabinet provided with a plurality of openings therein, and sound amplifying means being adjustable to communicate with said sound reproducing means and to substantially register with any one of said openings in said cabinet.

13. In a talking machine, the combination with a cabinet having a plurality of openings therein, of an amplifier, and means to secure said amplifier in said cabinet with its discharge end in substantial alinement with any one of said openings.

14. In a talking machine, the combination with a cabinet having a vertical elongated aperture in a side thereof, of an amplifier in said cabinet adjacent said aperture, said amplifier comprising comparatively rigid means forming the upper and lower edges thereof and vertical sounding-boards forming the sides thereof, the interior of said amplifier being divided by vertical spaced sounding-boards.

15. In a talking machine, the combination with a cabinet having a plurality of vertically elongated apertures therein, of an

amplifier in said cabinet and having a delivery end adjustable to open substantially in alinement with any one of said apertures.

16. In a talking machine, the combination with a cabinet having a plurality of openings therein, of an amplifier, and means to secure said amplifier in said cabinet with its discharge end opening toward any one of said openings.

17. In a talking machine, the combination with a cabinet having a plurality of vertically oblong openings therein, of an amplifier having a vertically oblong discharge end adjustable in said cabinet to register with any one of said openings.

18. A talking machine comprising a cabinet having a vertically elongated aperture in an exterior vertical wall thereof, of an amplifier in said cabinet and having an open delivery end in substantial alinement with said aperture, said amplifier being vertically elongated in transverse sections and comprising a hollow body portion including a substantially vertical sounding board forming a side thereof and a sounding board dividing the interior of said body portion into a plurality of sound passages.

19. In a talking machine the combination with a cabinet having a vertical transverse compartment provided with an opening in each of a plurality of the walls thereof, of an amplifier having a delivery end in said compartment, and a movable closure for each of said openings, said delivery end capable of being directed toward any one of said openings and having substantially the same shape as said compartment in vertical cross section.

20. In a talking machine, the combination with a cabinet having an opening in each of a plurality of walls thereof, of an amplifier in said cabinet having a delivery end opening toward one of said openings and having a side opposite another of said openings all of said openings leading from a single compartment in which said amplifier is located.

21. In a talking machine, the combination with a cabinet having a compartment provided with an opening in each of a plurality of the walls thereof, of an amplifier having a delivery end in said compartment and opening through one of said openings and having a substantially flat side substantially parallel to and opposite another of said openings.

22. In a talking machine, the combination with a cabinet providing a compartment having an opening in one wall thereof, of a sounding-board entirely inclosed within said compartment, the sides of said sounding-board being substantially parallel to said opening, and a movable closure for said opening, said sounding-board being restrained only at its periphery.

23. In a talking machine the combination  
with a compartment having an opening in  
one wall thereof, of a sounding board en-  
tirely inclosed in said compartment, the  
5 side of said sounding board being substan-  
tially parallel to and opposite said opening.

In witness whereof I have hereunto set

my hand this 17th day of February A. D.  
1909.

JOHN C. ENGLISH.

Witnesses:

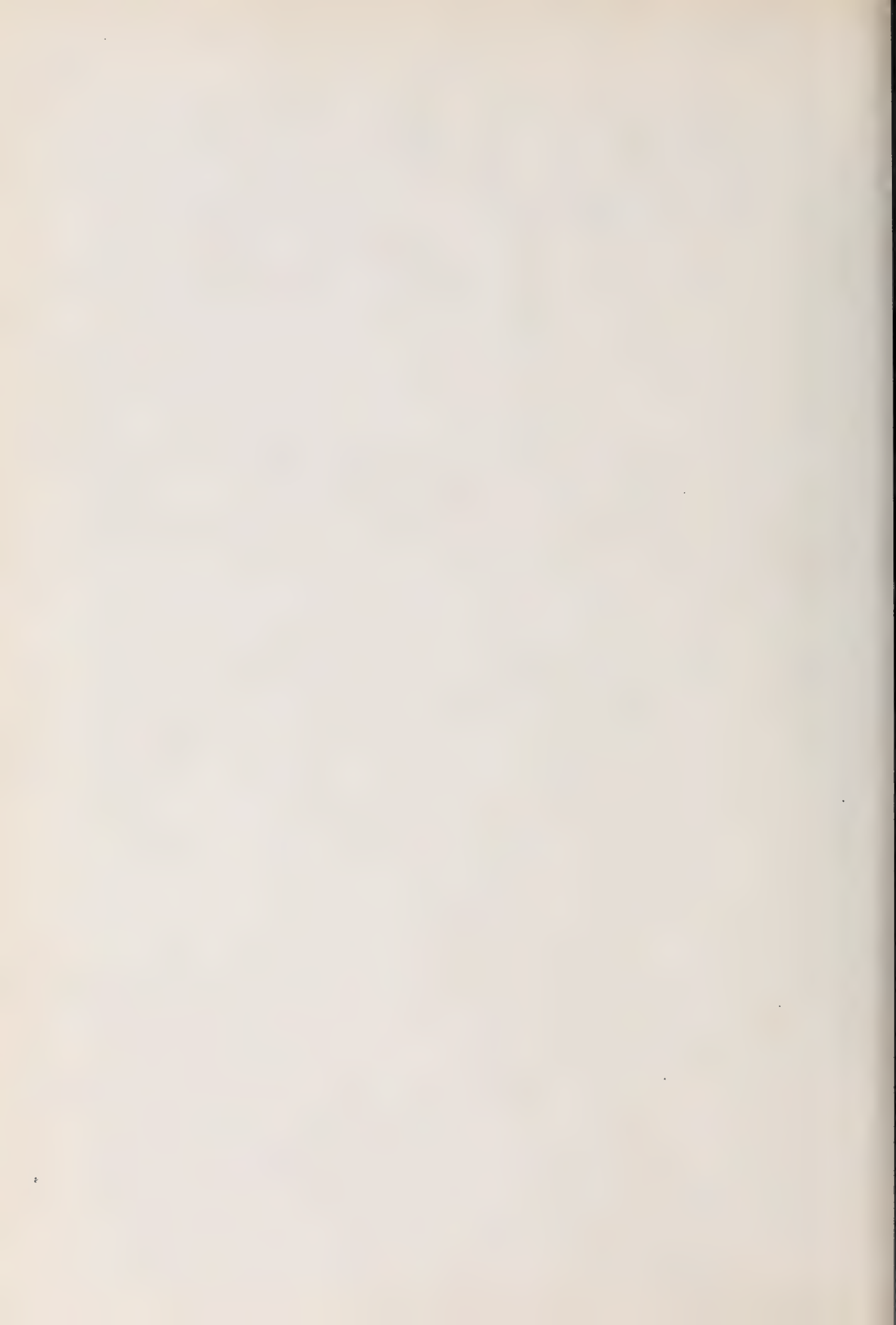
FRANK B. MIDDLETON, Jr.,

ALSTON B. MOULTON.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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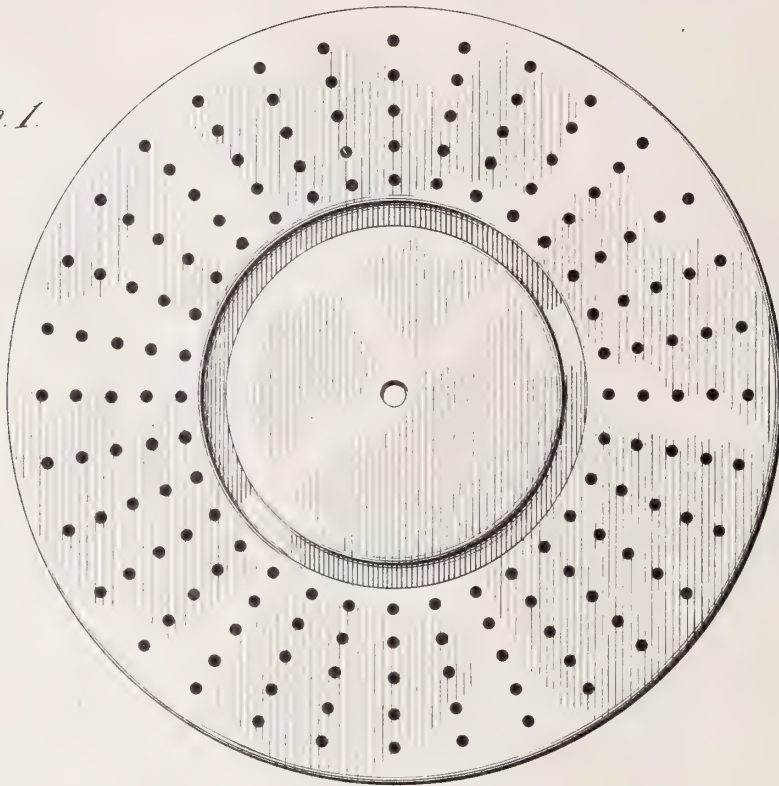


E. R. JOHNSON.  
RECORD FOR TALKING MACHINES.  
APPLICATION FILED AUG. 30, 1904.

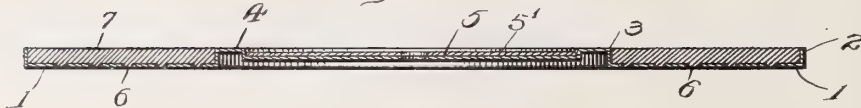
1,016,271.

Patented Feb. 6, 1912.

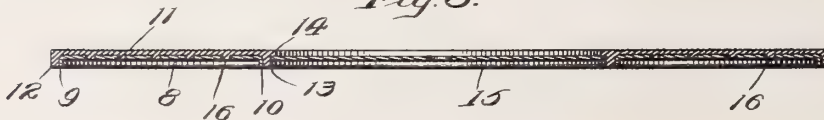
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



WITNESSES:

*H. J. Hartman.*  
*Edw. W. Vail Jr.*

INVENTOR

*Eldridge R. Johnson.*  
BY *Wm. Peltz.*  
ATTORNEY.

# UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF MERION, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

## RECORD FOR TALKING-MACHINES.

1,016,271.

Specification of Letters Patent.

Patented Feb. 6, 1912.

Application filed August 30, 1904. Serial No. 222,686.

*To all whom it may concern:*

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of Merion, county of Montgomery, State of Pennsylvania, have invented certain new and useful Improvements in Records for Talking-Machines, of which the following is a full, clear, and complete disclosure of one form of my invention.

Heretofore in the manufacture of flat disk records for talking machines it has been the practice to stamp out the record disks from a suitable material by means of a die containing a matrix upon the surface of which has been engraved or otherwise placed the record grooves, which grooves, in connection with the sound box are adapted to reproduce the sounds impressed upon the original record. The record disks formed by so impressing the matrices have usually been of some durable material which softens under the influence of heat, but which is hard and firm under normal conditions of temperature. The material usually employed for making these records has been in the form of flat sheets which have been of uniform thickness throughout the entire extent of the disk with the possible exception of the central portion where the label has been impressed or countersunk into the material during the pressing or forming of the record. This material, in many instances, has been the substance called "duranoid" which consists of shellac and certain other coloring pigments and strengthening ingredients. Other similar materials which have been used are hard rubber and celluloid. It will be realized that these compositions are expensive when used in large quantities, especially in view of the fact that talking machine records now employed in this art have been steadily increasing in size.

The object, therefore, of my invention is to produce a record which may have all the advantages of a flat disk record of uniform thickness but which will at the same time be much lighter and, therefore, less expensive in original cost and also will be easier to handle and less expensive in transportation either by mail, freight, or express.

A further object of my invention is the production of a record which will have strengthening means applied in such a manner as to give a stiff and firm backing for the reproducing surface without the neces-

sity of employing the larger amount of material required in a disk record made entirely of duranoid or other similar substance.

Briefly, my invention comprises a disk record having upon its under side a metallic plate or backing made in different forms so as to retain the record material firmly in position and at the same time, to protect the record material from injury to which it would otherwise be liable owing to its reduced thickness. The metallic backing may also extend across the central portion of the record not occupied by the record grooves and may form a centering means for the record when placed upon the turntable. The central portion of the record may also be occupied by an independent disk of metal or other material which forms the centering means and which is fixed in position during the stamping or forming process.

For a full, clear and exact description of these forms of my invention reference may be had to the specification and to the accompanying drawings forming part thereof in which—

Figure 1 is a reverse plan view of a talking machine record having the strengthening plate applied thereto. Fig. 2 is a transverse sectional view of the form of record shown in Fig. 1 and Fig. 3 is a transverse sectional view of a modification showing the centering disk placed in position independently of the metallic backing.

Referring to the drawing the numeral 1 indicates a circular metallic plate having an outer flange 2, an inner flange 3, and a central portion 4, the greater part of the central portion being countersunk as indicated at 5 to form a seat or recess for the record label 5'. The annular portion of the plate 1 is provided with a series of holes or perforations 6 which are adapted to receive portions of the record material 7, which is included between the flanges 2 and 3 and thereby hold the same in position within the recess formed by said flanges. The record material 7 is placed in the annular trough or recess formed by the flanges 2 and 3 in any suitable manner but I prefer to place the same therein during the process of stamping or impressing the record grooves in said material so that part of the record containing the record grooves may be formed at a single operation.

In the modification shown in Fig. 3 the function and result obtained are similar to those of the modification above described but instead of having the backing a continuous plate the same consists of an annular plate 8 having transverse flanges 9 and 10 at its edges. In this form the record material 11 is molded about the annular plate 8 so as to form outer and inner flanges 12 and 13. The flange 13 is also formed with an upper circular rib or flange 14 against which the disk 15 forming the means for centering the disk is seated.

The annular plate 8 is also preferably provided with the holes or perforations 16 for more intimately uniting the record material 11 with its backing.

The materials used in the backing for this form of record may be any stiff, durable substances in the form of a plate or may be stamped or molded into the required form, such metals as sheet iron or steel, brass, tin or aluminium being especially adaptable for this purpose.

The material which forms the surface for receiving the record grooves may be the material usually employed, provided it can be molded about the backing and provided it also may receive the record grooves during the operation of forming or stamping the record.

I do not wish to be limited to the exact form and arrangement of the parts shown and described herein, for the same may be varied in many ways without departing from the spirit and scope of my invention, but

What I claim and desire to protect by Letters Patent of the United States, is:—

1. A record for a sound recording and reproducing machine comprising a sheet metal disk having two concentric depressions,

the one being annular in shape located adjacent the periphery, and the other occupying the central portion of the disk and having a flat inner surface provided with a central aperture, and record material secured within said annular depression, the said disk having the part thereof between the said concentric portions formed into a ring substantially rectangular in cross section, having its outer face substantially flush with the surface of the record material, said ring being open upon one side.

2. A record for a sound recording and reproducing machine, comprising a sheet metal disk having an annular depression located adjacent to the periphery of the same, and record material secured within said annular depression, the said disk having the part thereof adjacent to the inner side of said depression formed into a rib substantially rectangular in cross section, having its outer face substantially flush with the surface of said record material, said rib being open on one side.

3. A record for a sound recording and reproducing machine comprising a sheet metal disk having an annular depression located adjacent to the periphery of the same, and record material secured within said annular depression, said disk having the part thereof adjacent to the inner side of said depression formed into a rib substantially rectangular in cross section and open on one side.

In witness whereof I have hereunto set my hand this 29th day of August, A. D., 1904.

ELDRIDGE R. JOHNSON.

Witnesses:

WILLIAM B. BREMAN,  
EDW. W. VAILL, Jr.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."





O. W. HARTUNG.  
STOP MECHANISM FOR PHONOGRAPHS.  
APPLICATION FILED APR. 5, 1911.

1,016,563.

Patented Feb. 6, 1912.

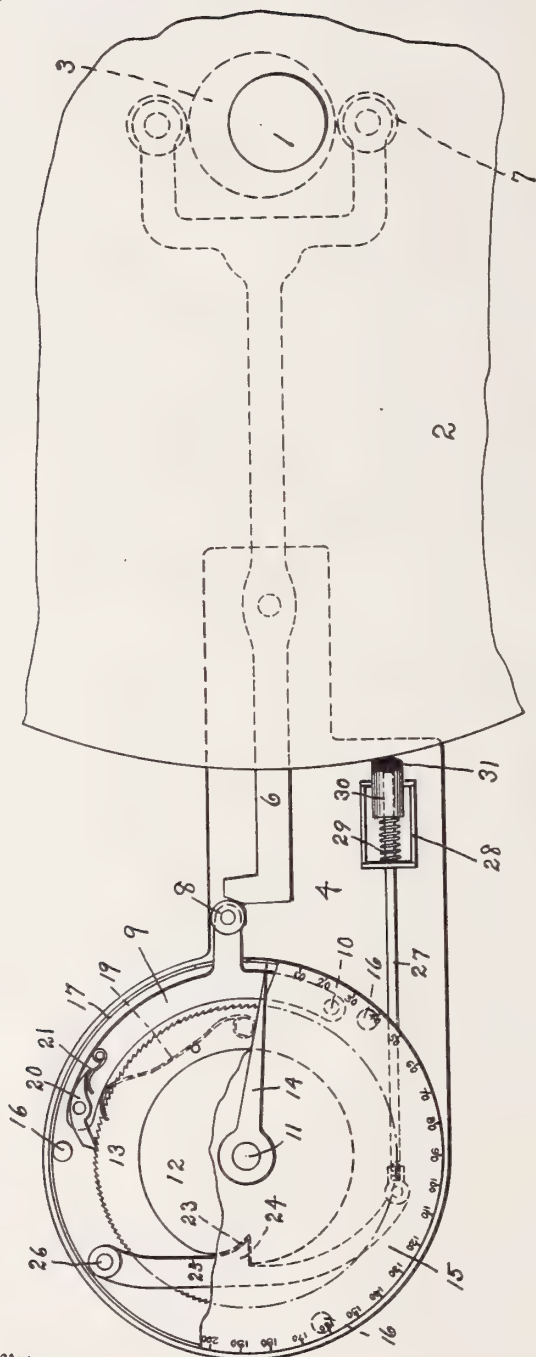


Fig. 1.

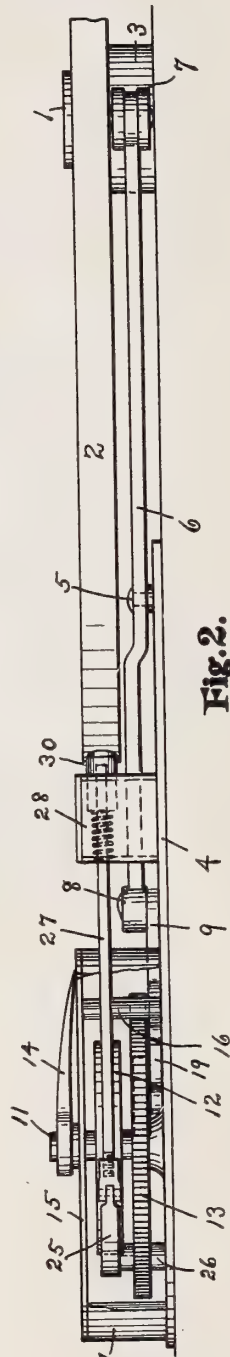


Fig. 2.

Witnesses  
Albert A. Hofmann  
Elizabeth M. Crown

Inventor.  
O. W. Hartung.  
By Edward N. Pagehen, Attorney

# UNITED STATES PATENT OFFICE.

OSCAR W. HARTUNG, OF DETROIT, MICHIGAN.

## STOP MECHANISM FOR PHONOGRAPHS.

1,016,563.

Specification of Letters Patent.

Patented Feb. 6, 1912.

Application filed April 5, 1911. Serial No. 619,187.

*To all whom it may concern:*

Be it known that I, OSCAR W. HARTUNG, a citizen of the United States, and a resident of Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Stop Mechanism for Phonographs, of which the following is a specification.

This invention relates to means for stopping the record-supporting table of phonographs, gramophones and other sound reproducing instruments after they have made a predetermined number of revolutions, and its object is to provide a stop mechanism which can be set for any desired number of revolutions within its range without the necessity of altering the adjustment of any of its parts, but by merely positioning an indicator for the number of revolutions desired.

This invention consists, in combination with a spring actuated brake adapted to engage the supporting table of a sound reproducing instrument, and a lever to hold same in inoperative position, of a graduated dial, a pointer adapted to be swung over the dial to indicate the number of revolutions, a notched disk against which the lever presses and which holds the lever outward until the predetermined number of revolutions have been made by the table, a toothed wheel to turn the notched disk and pointer, and an operating device to actuate the toothed wheel, which device is operated by the mechanism which revolves the table that is to be stopped.

In the accompanying drawing, Figure 1 is a plan of the stop mechanism, a portion of the dial being broken away for clearness. Fig. 2 is an elevation of the same with the case broken away.

The same reference characters refer to like parts in both views.

Disk records for sound reproducing instruments vary in the number of spirals of record upon them, and it is desirable to stop their revolutions when the sound reproduction is completed, so as to prevent unnecessary wear of the stylus. The number of the engraved spirals may be indicated in any desired manner, either by placing a suitable character on the record or upon its envelop.

In the drawing, 1 is the main shaft of any sound reproducing machine which shaft carries a record table 2 and an eccentric

3. A plate 4 may be secured to the case of the driving mechanism of the instrument or connected thereto in any desired manner. Mounted on the pivot 5 carried by this plate is a lever 6, having anti-friction rollers 7 which engage the eccentric 3. The opposite end of the lever is inclined to form a cam which engages a roller 8 on a swinging arm 9, pivoted at 10 to the plate 4. Revolvably mounted on this plate is a shaft 11 to which is secured a notched disk 12, a toothed wheel 13, and a pointer 14. The pointer moves over a graduated dial 15, supported by posts 16, which dial furnishes a bearing for the upper end of the shaft 11. A shell 17 may inclose this mechanism, being provided with necessary apertures. The arm 9 is moved outward by any proper spring 19, and carries a pawl 20, held against the toothed wheel by a small spring 21.

The disk 12 has a notch 23 adapted to receive a tooth 24 on the lever 25, which lever is pivoted on the post 26. A rod 27 connects to the free end of this lever and its opposite end is slidable in a guide 28 in the form of a covered trough secured to the plate 4, in which is a spring 29 adapted to press the enlarged brake end 30 of the rod 27 against the record table 2. This enlarged end may be provided with a rubber cap 31.

The operation of the mechanism is as follows: When a record is placed on the table and the number of revolutions determined, the pointer 14 is turned (to the left) to the number desired. This will turn the disk 12 and thus press the tooth 24 and the lever 25 outward, pulling the brake 30 away from the record table 2, which may immediately begin to revolve. At each revolution, the eccentric 3 will swing the lever 6 and the arm 9, and the pawl 20 will turn the toothed wheel 13 one step. When the desired number of revolutions have been made, the pointer will have returned to zero on the dial and the notch 23 will have returned to the position shown in Fig. 1, when the spring 29 will be permitted to swing the tooth 24 on the lever 25 into the notch 23 and to press the brake 30 against the table to stop it.

Many changes in the details of this construction may be made within the scope of the claims without departing from the spirit of my invention.

Having now explained this construction and the mode of its operation, what I claim as my invention and desire to secure by Letters Patent is:—

5 1. In a stop mechanism for sound reproducing instruments, the combination of a notched disk, a lever mounted adjacent thereto and having a tooth adapted to enter the notch, a brake rod connected to said lever, a spring to move the rod to braking position when permitted by the disk, a graduated dial, a pointer movable over the dial to position the notched disk, and means actuated by the sound reproducing instrument to revolve said disk.

10 2. In a stop mechanism for sound reproducing instruments, the combination of a disk provided with a notch, a lever mounted adjacent thereto and having a tooth adapted to ride on the periphery of the disk and to enter the notch, a brake rod connected at one end to said lever, a guide for the other end of the rod, and a spring to press the end of the rod against the table of the sound reproducing instrument when permitted by the notched disk, and means connected to said table for turning said disk.

15 3. In a stop mechanism for sound reproducing instruments, the combination of a disk provided with a notch, a lever mounted adjacent thereto and having a tooth adapted to ride on the periphery of the disk and to enter the notch, a brake rod connected at one end to said lever, a guide for the other end of the rod, and a spring to press the end of the rod against the table of the sound reproducing instrument when permitted by the notched disk, means connected

to said table for turning said disk, a graduated dial, and a pointer connected to said disk and movable over the dial to indicate the number of revolutions of the table desired.

4. In a stop mechanism for sound reproducing instruments, the combination of a vertical revoluble shaft, an indicator at the upper end thereof, a disk having a notch in its periphery and a toothed wheel secured to said shaft below the indicator, an arm and pawl to actuate the toothed wheel, disk and indicator, an operating lever engaging the arm and actuated by the mechanism of the sound reproducing instrument, a lever pivoted adjacent the disk and having a tooth adapted to enter said notch, a rod connected to the free end of the lever and having an enlarged end adapted to act as a brake for the mechanism of the instrument, and a spring to move the brake to operating position.

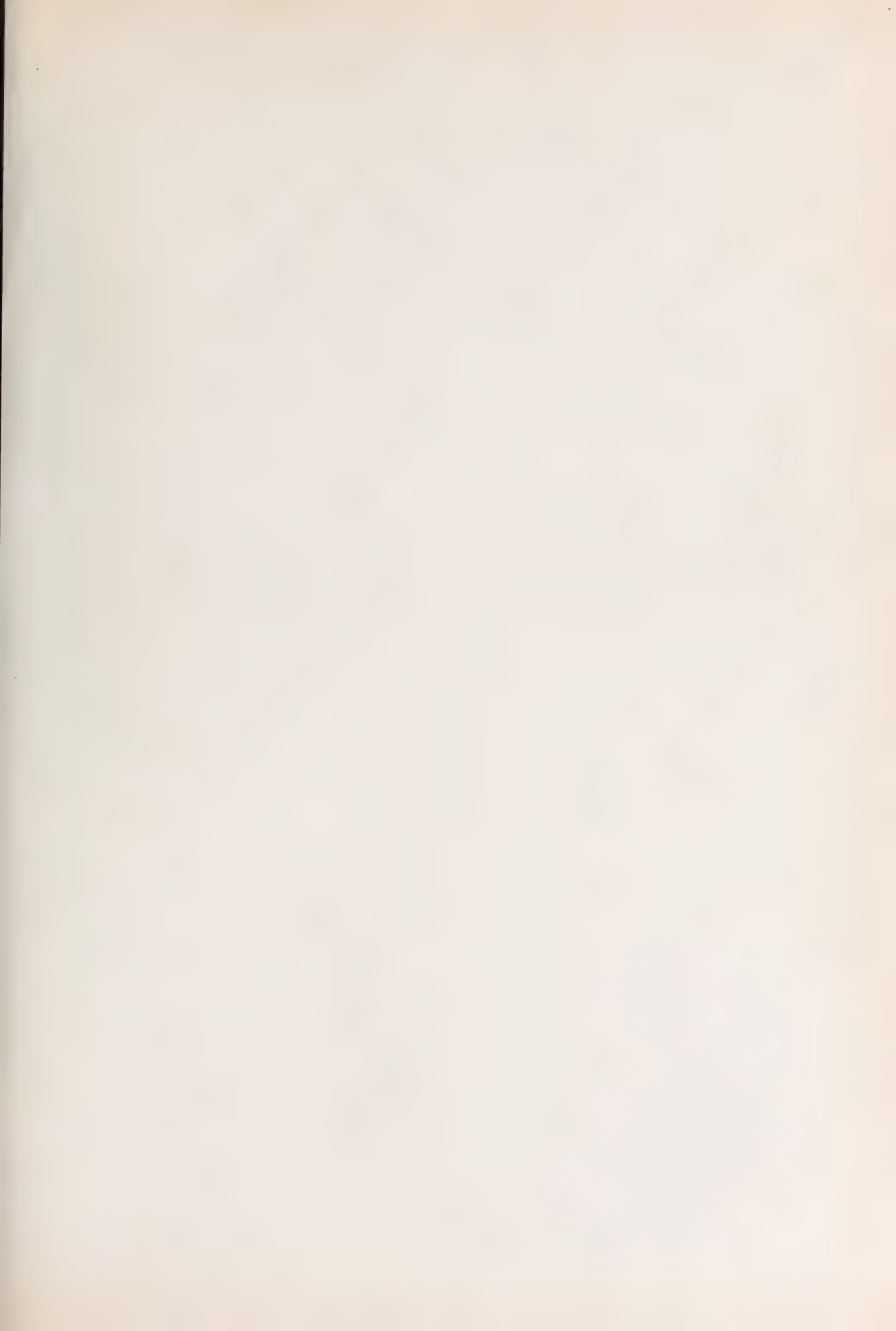
5. In a stop mechanism, for the tables of sound reproducing instruments, the combination of a spring pressed brake for said table, a lever connected thereto, a notched disk engaging said lever and normally holding the brake inoperative, means comprising an indicator for positioning said disk, and means actuated by the driving mechanism of the table for revolving said disk.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

OSCAR W. HARTUNG.

Witnesses:

ELIZABETH M. BROWN,  
EDWARD N. PAGELSEN.

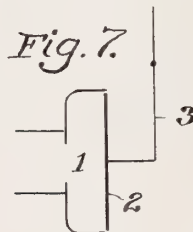
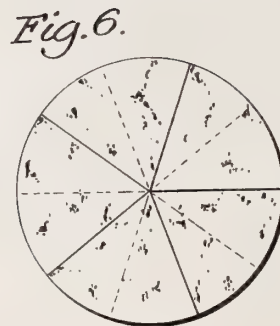
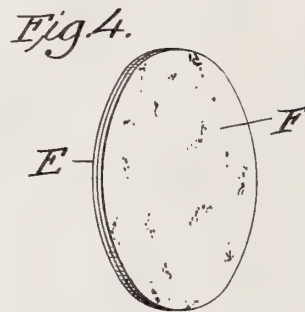
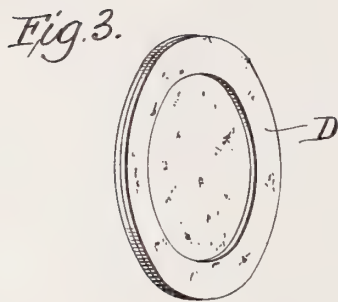
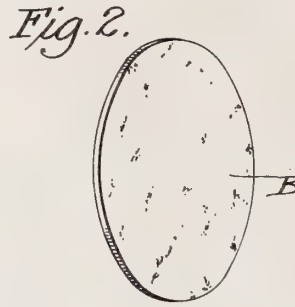
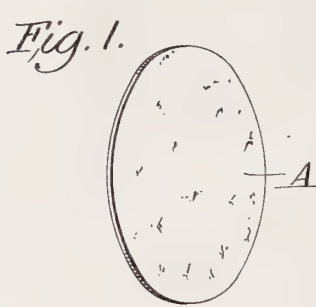




F. B. MEECH.  
 DIAPHRAGM.  
 APPLICATION FILED OCT. 4, 1910.

1,016,704.

Patented Feb. 6, 1912.



WITNESSES  
*James F. Duhamel*  
*Grace T. Lipson*

INVENTOR  
*Frank B. Meach*  
 BY *Arthur*  
*his* ATTORNEY

# UNITED STATES PATENT OFFICE.

FRANK B. MEECH, OF NEW YORK, N. Y.

## DIAPHRAGM.

1,016,704.

Specification of Letters Patent.

Patented Feb. 6, 1912.

Application filed October 4, 1910. Serial No. 585,278.

*To all whom it may concern:*

Be it known that I, FRANK B. MEECH, a citizen of the United States, residing at New York, in the county and State of New York, have invented new and useful Improvements in Diaphragms, of which the following is a specification.

This invention relates to sound apparatus where sound vibrations are received from or transmitted to a diaphragm.

More particularly the invention relates to a diaphragm where voice or musical sound vibrations are received or utilized, such vibrations or waves being compounded from many individual sound sources or component vibrations, and resulting in a complicated or intricately composed wave. If the diaphragm does not respond exactly to the wave form in all its detail and complication, the purity of the sound will be lost.

One of the objects of the present invention is to provide a diaphragm of such a character that the sound purity will be preserved; in other words in which the sound wave will be received or utilized without changing its characteristics, even in the more minute or complicated details of sound wave form.

So far as I am aware, diaphragms have hitherto been made on the principle of securing merely high elasticity; mica, glass, copper, aluminum or other similar sonorous substances being examples. Such materials by virtue of their elastic and sonorous character seem to be and are adapted to give certain acoustic results. So far as I am aware the effort at improvement has hitherto been constantly in the direction of obtaining materials more elastic and more vibratile or sonorous in character than those hitherto utilized, and the latest developments are in the direction of mica as being a material having the above characteristics most prominently inherent in it.

It is one of the objects of the present invention to utilize new principles of action which have not been hitherto considered as having any bearing or relation, and by utilizing such new principles to provide an improved diaphragm.

The invention relates to an improved diaphragm in its various aspects.

To this end the invention consists in the material employed and in the constructions and combinations as hereinafter set forth.

In the drawings, Figure 1, is a perspective view of a diaphragm embodying the princi-

ples of my invention; Fig. 2, is a similar view showing a modified form of diaphragm; Figs. 3 and 4, illustrate further modifications; Figs. 5 and 6, are respectively sectional and front views of another modified form of diaphragm embodying the invention, and Fig. 7, shows diagrammatically the use of a diaphragm in a sound recording or reproducing apparatus.

The invention will include a cellular diaphragm of a material which is light in weight. In accordance with the principles of vibration and motion, the inertia or weight of any thing acted upon tends to produce a lag between the cause and effect *i. e.* between action and the motion resulting from the action. The reducing of the weight is therefore a matter of importance, which, however, is related to other matters of equal importance. A second principle or attribute of my diaphragm is flexibility, meaning flexibility in different ways or directions. A third principle or attribute is uniformity in any elastic stress or strain put on the material by any deformation. A fourth principle or attribute of the present diaphragm is absence of viscosity, the ideal material being one which recovers its original form instantly when the deforming influence is removed. A fifth principle or attribute is that the factors above mentioned *i. e.* flexibility, uniform elasticity and absence of viscosity must be present particularly in deformations of the diaphragm between narrow ranges or limits of movement or deformation, rather than between wide limits, in order to suit the microscopic character of actual sound vibration.

In order to find a material satisfying the above principles and requirements, I have conducted experiments and have discovered that cork when cut in sheet form and made into a diaphragm gives results which are not only superior to any results hitherto obtained, but are markedly different in character, particularly with reference to the purity of the sound received or utilized. The invention will therefore in its best form include cork in the form of a diaphragm as A in Fig. 1. The actual forms, details and arrangement of the cork diaphragm may be varied. The cork may be in its natural state, or may be compressed, or it may be treated or used in preparations known as composition cork. It may be cut in thin sheets A, Fig. 1, or thick sheets B, Fig. 2. It

may be of uniform or varied thickness and made in unitary construction as in Fig. 1, or in sectional construction, as shown in Figs. 5 and 6. In these figures there is provided  
 5 a plurality of sectors or sections grouped around a common center and associated into unitary form by cement or otherwise.

The diaphragm may have a thickened rim portion as D, Fig. 3, either integral or separately applied. It may be made of two  
 10 sheets or sections such as E and F Fig. 4 cemented together so as to cure the natural porosity of a plain cork sheet.

The essential physical characteristic of my  
 15 improved diaphragm which distinguishes it from other diaphragms hitherto used, is that it has a very light comparatively homogeneous cellular structure. In addition to this there is the further characteristic that its  
 20 tension in a given median plane of vibration is wholly dependent on its own resiliency, or in other words is not dependent on outside factors such as metal plates.

The microscopic cellular structure of my  
 25 diaphragm is such that it is almost perfectly elastic to recover itself from deformation through a minute deflection, although when considerably deformed it does not appear to be elastic and does not recover itself  
 30 promptly. This is due to the cellular character of the cork, the cells being very much like a mass of bubbles of very small size and uniformly homogeneous in all planes. A very small deflection does not bend or crush  
 35 any of the walls between the cells, which walls are exceedingly thin and delicate. The vibration on the other hand is a true vibra-

tion, and the recovery of the cork is doubtless due to the air in the cells as well as the resiliency of their delicate cellular walls.

In accordance with my present diaphragm the stiffness is secured not by tensioning the diaphragm, but by making it quite thick, for  
 40 example  $\frac{1}{16}$  or  $\frac{1}{8}$  of an inch in thickness.

In Fig. 7 I have shown diagrammatically one use of the diaphragm in a sound box for  
 45 sound recording and reproducing purposes. 1 denotes the sound box; 2 the diaphragm therein, and 3 the means or stylus connected to said diaphragm for transmitting sound  
 50 vibrations.

While I have described certain forms of diaphragm I do not desire to be particularly limited or restricted to the particular constructions shown, since variations may be  
 55 made within the principles of the invention, without departing from the spirit or scope thereof.

What I claim is:—

A diaphragm for sound recording and reproducing apparatus comprising a disk or  
 60 plate of natural cork permanently cemented to a similar disk or plate of natural cork, said plates of cork being adapted to transversely stiffen one another throughout their  
 65 entire area.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, this 3rd day of  
 October 1910.

FRANK B. MEECH.

Witnesses:

GRACE T. DIXON,  
 ALFRED W. PROCTOR.





L. F. DOUGLASS.

SOUND BOX.

APPLICATION FILED JUNE 5, 1909.

1,017,041.

Patented Feb. 13, 1912.

Fig. 1.

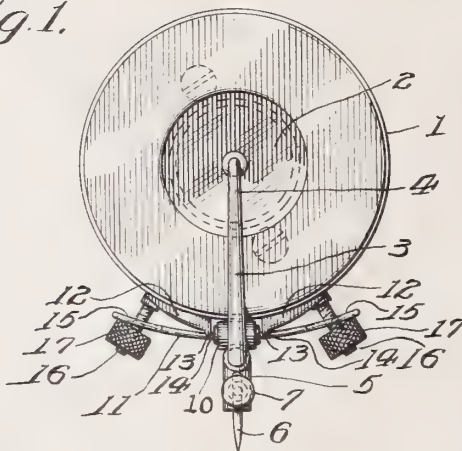


Fig. 2.

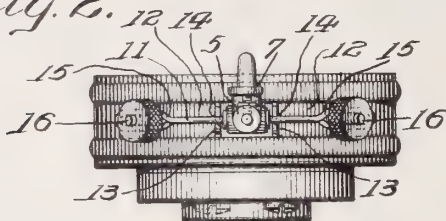


Fig. 3.

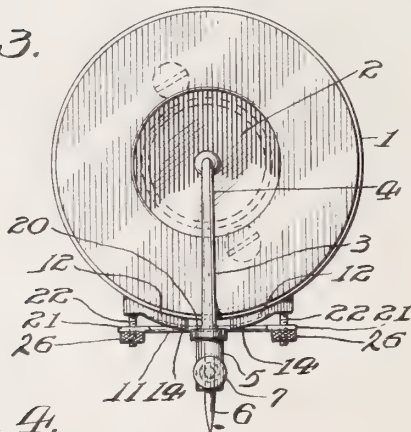
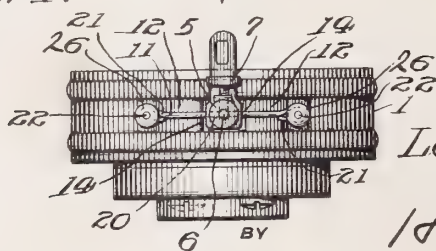


Fig. 4.



WITNESSES

*W. J. Hartman.*

*W. J. Gardner.*

INVENTOR

*Leon F. Douglass*

*Harold Peltz.*

ATTORNEY

# UNITED STATES PATENT OFFICE.

LEON F. DOUGLASS, OF SAN RAFAEL, CALIFORNIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

## SOUND-BOX.

1,017,041.

Specification of Letters Patent.

Patented Feb. 13, 1912.

Application filed June 5, 1909. Serial No. 500,356.

*To all whom it may concern:*

Be it known that I, LEON F. DOUGLASS, a citizen of the United States, and a resident of San Rafael, county of Marin, and State of California, have invented certain new and useful Improvements in Sound-Boxes, of which the following is a specification.

This invention relates to improvements in sound boxes for sound recorders and reproducers; and the objects of this invention are to provide in a sound box an improved mounting for a stylus bar; and to provide other improvements as will appear hereinafter.

In the drawings, Figure 1 is a front elevation of a sound box constructed in accordance with this invention; Fig. 2 a bottom plan view of the same; Fig. 3 a front elevation of a modified form of this invention; and Fig. 4 a bottom plan view corresponding to Fig. 3.

Referring to the drawings, one embodiment of this invention comprises the usual sound box casing 1, carrying mounted therein the usual diaphragm 2. A stylus bar 3 having its inner end 4 connected to the central portion of the diaphragm by any suitable means, extends radially outwardly over the front of the box.

The outer end of the stylus bar, beyond the periphery of the sound box casing, is preferably off-set rearwardly and then projects radially outwardly and the outer end 5 of the stylus bar is provided with the usual socket for holding the stylus 6, and with the usual set screw 7 for holding the stylus in place, the longitudinal axis of the stylus socket and stylus being preferably substantially in the plane of the diaphragm.

For mounting the stylus bar to oscillate with respect to the sound box casing, the bar is provided with a transverse tubular portion 10 rigidly secured to the inside of the off-set portion of the bar. Rigidly secured within this transverse tubular portion of the bar and normally projecting axially in opposite directions therefrom, is a torsional resilient rod or support 11, forming spaced torsional members for supporting the stylus bar.

For supporting the torsional rod 11, the sound box casing 1 is provided with a pair of spaced lugs 12, which are rigidly secured to the under side of the casing and project radially therefrom, the lugs being arranged

in close proximity, to the ends of the transverse tubular portion 10 of the stylus bar and upon opposite sides of the bar. Each lug is provided upon its end adjacent the stylus bar, with an outwardly projecting transverse rib or boss 13, which is recessed centrally as at 14 to form a bearing for the torsional bar 11, and these bearings are axially substantially in the plane of the diaphragm 2 of the sound box.

For holding the torsional support 11 of the stylus bar upon its bearings 14, the ends of the support or bar 11 are looped to form eyes 15, which are preferably oblong in shape, the long diameters of the eyes extending longitudinally of the torsional bar. Extending slidably through each of these eyes is a threaded stud 16, which is rigid with the adjacent lug 12, upon the sound box casing, and extends preferably radially from the sound box, the stud being of substantially the same diameter as the short diameter of the eye. Upon the outer end of each of these studs and outside of the corresponding loop 15 of the torsional stylus bar support is threaded a thumb nut 17, the outer surface of which is preferably knurled for convenience of operation. These nuts are adjusted to apply transverse pressures to the ends of the torsional support 11 to flex the ends inwardly and to place the torsional support under any suitable stress, to hold the support upon its bearings, and to hold the ends of the support against rotation. With this construction in mind, it is evident that a stylus bar thus mounted is free to oscillate upon a substantially fixed axis, substantially in the plane of the diaphragm, but is restrained in its oscillation by the torsional action of its support, which may be varied by adjusting the thumb nuts to suit various conditions, and by reason of the loops 15 being elongated, as best shown in Fig. 2, said torsional support may be adjusted to vary its torsional effect, without affecting its torsional constant.

A modified form of this invention, shown in Figs. 3 and 4, is similar to the form just described, except that the stylus bar is of slightly different form, the transverse tubular portion 10 heretofore described, being omitted, and the torsional support 11 being rigidly secured in a transverse groove 20, upon the inner surface of the off-set portion



of the bar, by being soldered or brazed therein or otherwise secured in place. The outer ends of the torsional support 11 in this modified form are provided with substantially circular eyes 21, instead of the oblong eyes heretofore described, and the threaded studs 22 engaging in these eyes project in substantially parallel directions from the sound box casing, instead of diverging radially as in the previous form. In this form of invention, when the nuts 26 are threaded toward the sound box casing, the torsional support 11 is slightly flexed to hold the support upon its bearing 14 and to hold the ends of the support against rotation.

Although only two of the various forms in which this invention may be embodied have been illustrated, the invention is not limited to the constructions shown as various other forms might also be used in embodying this invention without departing from the spirit of the invention or the scope of the appended claims.

Having thus fully described this invention, I claim and desire to protect by Letters Patent of the United States:

1. The combination with a stylus bar, of a mounting therefor comprising a torsional member, means arranged to flex said torsional member, without effecting a tensional strain on said torsional member, and means to prevent relative twisting of the opposite ends of said torsional member.

2. The combination with a stylus bar, of a mounting therefor comprising a torsional member rigidly secured to said bar, and means arranged to flex said torsional member by bowing from its connection with said bar, without tending to shift said bar.

3. The combination with a stylus bar, of a mounting therefor comprising a torsional resilient member rigidly secured to said bar, means arranged to flex said torsional member, to vary the torsional coefficient, and means arranged to prevent a tensional strain of said resilient member.

4. The combination with a stylus bar, of a mounting therefor comprising a torsional rod rigidly connected to said stylus bar, and extending transversely thereof, and means adjustable to flex said rod by bowing, to vary its torsional effect without affecting the normal position of said bar.

5. The combination with a stylus bar, of a mounting therefor comprising a torsional member, spaced bearings having open grooves supporting said torsional member, and means arranged to flex said torsional member exterior to said bearings to hold the same upon said bearings.

6. The combination with a stylus bar, of a mounting therefor comprising a bearing, a

torsional member connected to said bar and engaging in said bearing, and means arranged to flex said torsional member exterior to said bearing to hold the same in said bearing, and to vary its torsional effect, independent of its tensional constant.

7. The combination with a pair of fixed bearings, of a stylus bar arranged between said bearings, a pair of torsional arms connected to said bar and supported by said bearings, the outer ends of said arms projecting freely outwardly from said bearings, and having loops and adjustable means extending through said loops engaging the free ends of said arms to flex the same.

8. The combination with a stylus bar, of a mounting therefor comprising a pair of spaced projections, each provided with a groove and arranged upon opposite sides of said bar, a torsional member connected to said bar and engaging in said grooves, the ends of said member being free to flex, and means engaging the free ends of said torsional member, exterior to said projections, to flex the same to hold it in said grooves.

9. The combination with a stylus bar, of a mounting therefor comprising a pair of spaced bearings upon opposite sides of said bar, a torsional resilient cylindrical member connected to said bar and engaging in said bearings, the ends of said torsional member being free to flex, and adjustable means engaging the free ends of said torsional member exterior to said bearings, to flex the same.

10. In a sound box, the combination with a casing, of a diaphragm supported thereby, a stylus bar connected to said diaphragm, a pair of bearings, torsional arms supporting said bar and engaging in said bearings, the outer ends of said arms being free to flex and having elongated loops, threaded studs projecting through said loops from said casing, and nuts upon said studs engaging said arms to flex the same.

11. In a sound box, the combination with a casing, of a stylus bar, a pair of bearings oppositely disposed adjacent to said bar, a resilient member supporting said bar and having free elongated looped ends extending exterior to said bearings, and adjustable means extending through said loops to vary the coefficient of torsion of said member by bowing said member independent of said stylus bar.

In witness whereof I have hereunto set my hand this 28 day of May, A. D. 1909.

LEON F. DOUGLASS.

Witnesses:

WILLIAM J. BOYD,  
JAMES B. DAVIDSON.



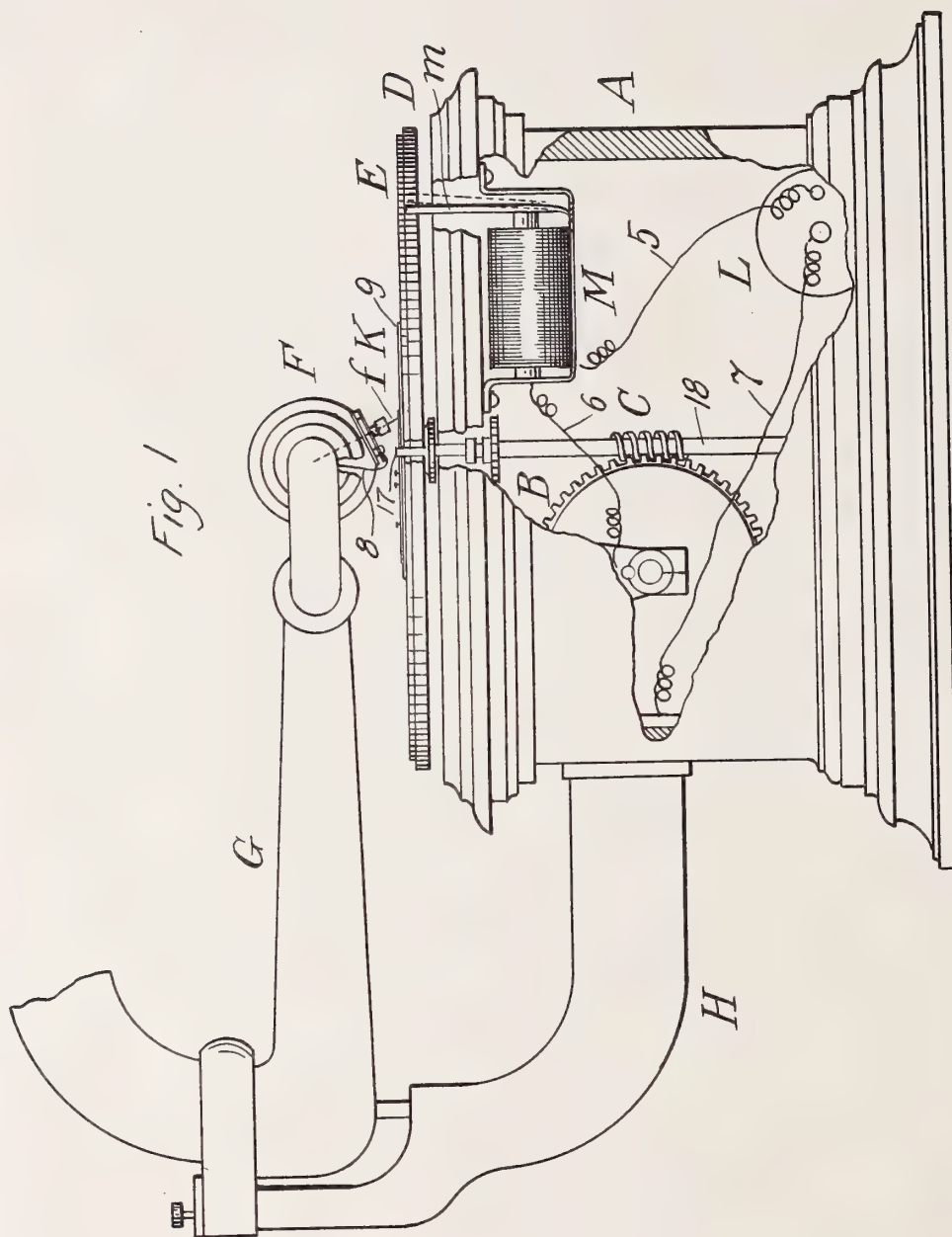


R. A. WHITEHEAD.  
SOUND PRODUCING APPARATUS.  
APPLICATION FILED OCT. 5, 1910.

1,017,834.

Patented Feb. 20, 1912.

2 SHEETS—SHEET 1.



Witness:  
O. W. Pierce  
Elizabeth C. Mosher.

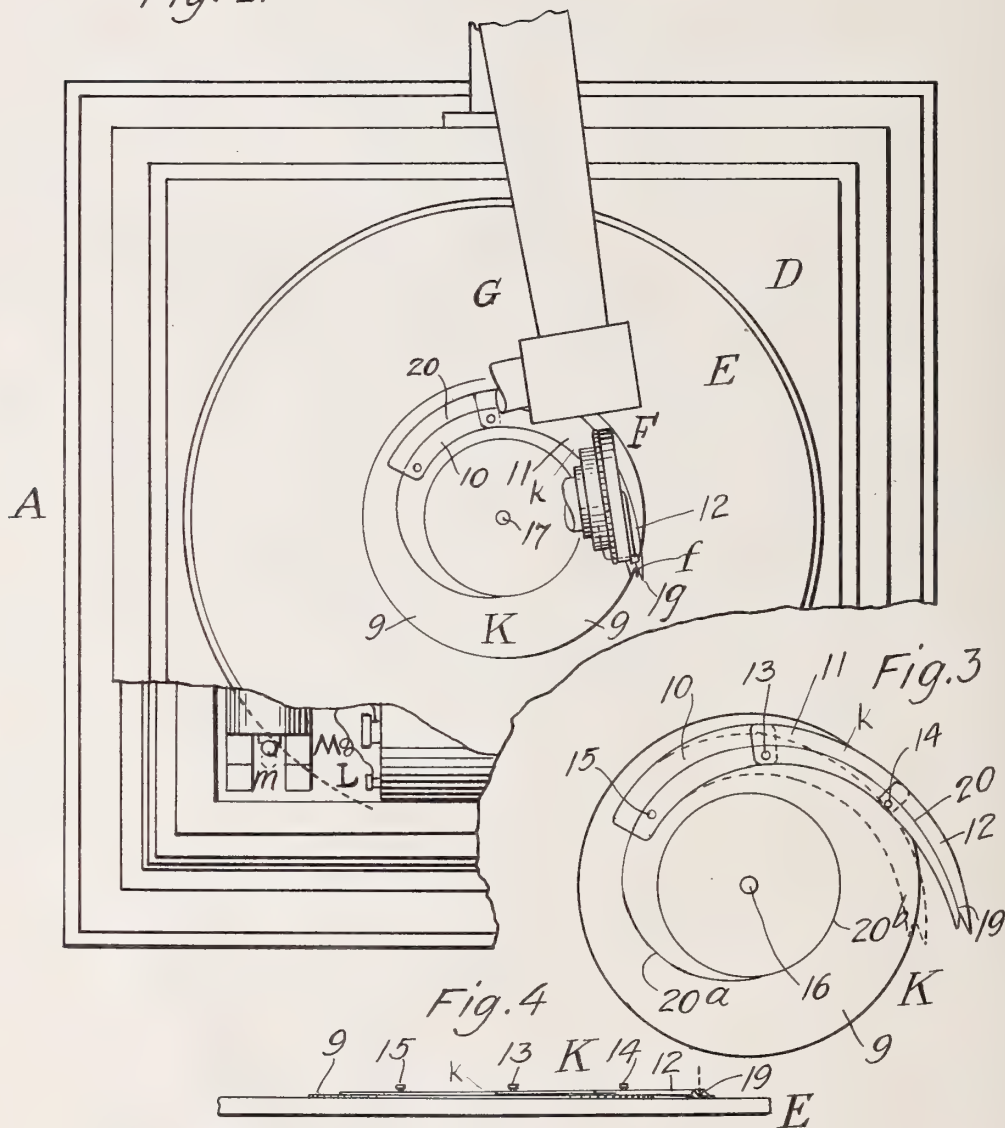
Inventor:  
Richard A. Whitehead,  
by Buckner & Glendon,  
his attorneys.



1,017,834.

2 SHEETS—SHEET 2.

Fig. 2.



Witness:  
J. W. Pierce  
Elizabeth C. Moskee

Inventor:  
Richard A. Whithead,  
by Becker & Woodhull,  
his attorneys.

# UNITED STATES PATENT OFFICE.

RICHARD A. WHITEHEAD, OF LOS ANGELES, CALIFORNIA. ASSIGNOR OF ONE-HALF TO  
GLENN R. WATERMAN, OF LOS ANGELES, CALIFORNIA.

## SOUND-PRODUCING APPARATUS.

1,017,834.

Specification of Letters Patent.

Patented Feb. 20, 1912.

Application filed October 5, 1910. Serial No. 585,481.

*To all whom it may concern:*

Be it known that I, RICHARD A. WHITEHEAD, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Sound-Producing Apparatus, of which the following is a specification.

This invention relates to sound producing apparatus, and more particularly to means for throwing the same out of operation at the termination of the rendition of a song or instrumental or vocal selection, or such sequence of sounds as may be produced in the operation of the apparatus; whereby operation of the apparatus is automatically terminated at the termination of such rendition; and the invention has for its object to provide improved apparatus of the character described, of electro-magnetic character, which will be superior in point of positiveness of operation, relative simplicity and inexpensiveness of construction and organization, and sightliness in appearance, which may be applied to sound producing apparatus of standard and conventional forms and types with but slight alteration of the same, which may be readily kept in repair, and which will be generally superior in efficiency and serviceability.

The invention consists in the provision, construction, combination, association and relative arrangement of parts, members and features hereinafter described and shown in the drawings, and finally pointed out in claims.

In the drawings:—Figure 1 is a side elevation, partly broken away and partly in section for clearness of illustration of sound producing apparatus, or a so-called talking machine, organized, equipped and constructed in accordance with the invention; Fig. 2 is a top plan view of the same, parts being likewise broken away for clearness of illustration; Fig. 3 is an enlarged detail plan view of an essential feature of the invention; and Fig. 4 is a fragmentary side elevation of the feature shown in Fig. 3, and a feature of the general construction of the apparatus.

Corresponding parts in all the figures are denoted by the same reference characters.

Referring with particularity to the drawings, the sound producing apparatus or talking machine therein shown, as of conven-

tional or standard form, although the invention is not limited to any specific type or form of such sound producing apparatus, comprises a casing A within which is located a motor B the power of which is applied through transmission means C to a disk table or support D above the casing, and upon which the sound record E is disposed.

F designates the sound box within which the sounds are produced through the co-action of the point or needle *f* and the sound record E, G designating the tubular arm or means of direction or conduction of the sounds to the orifice from which they exit to the auditor. The tubular arm G is shown as adjustably supported by the bracket H connected with the casing A, such casing A being of wood or other electricity insulating material.

K designates a circuit maker which is disposed upon the sound record E in physical connection with the transmission means C.

Within the casing A is disposed, in accordance with the invention, a battery L, or source of electrical supply, and within said casing is likewise disposed electro-magnetic means M the armature *m* whereof projects through a suitable opening in the top of the casing in position for engagement with the periphery of the table or support D to act as a brake therefor, or means for throwing the table, the transmission means and the motor out of operation when an electrical circuit is closed through the electro-magnetic means and the circuit maker K and the point or needle *f*.

The source of electrical supply L is electrically connected with the electro-magnetic means M by a circuit wire 5, the electro-magnet M is connected with the motor B by a circuit wire 6, and the bracket H is connected with the source of electrical supply L by a circuit wire 7. The sound box F is provided with a circuit wire 8 electrically connecting the needle or point *f* with the tubular arm G and the connections thereof, which are found in standard practice. This circuit wire bridges the non-conducting parts of the sound box. The arm G and its connections are electrically conducting, as is the bracket H, and as are the motor B and the transmission means C, while the table D and the sound record E are jointly non-conducting, or at least the record E is non-conducting. When the



needle *f* is in contact with the circuit maker K the electrical path is through the needle *f*, the circuit wire 8, the arm G and its connections, the bracket H, the circuit wire 7, the source of electrical supply L, the circuit wire 5, the electro-magnetic means M, the circuit wire 6, the transmission means C, and the circuit maker K again to the needle *f*. The bracket H is insulated from the motor B by the structure of the casing A.

The circuit maker K comprises a metallic body 9, preferably circular in form, adjacent to the periphery of which is adjustably connected an articulated guide *k*, which comprises a plurality of members 10, 11 and 12, which are pivotally serially connected, as at 13 and 14 by pins or the like, the innermost member 10 being pivotally connected with the body member or plate 9, as at 15. The outer member 12 overlaps the intermediate member 11 at the point of pivotal connection 14, and the intermediate member 11 overlaps the inner member 10 at the point of pivotal connection 13. The body or plate 9 and the articulated guide *k* are formed of metal or suitably conducting material. The members 10, 11 and 12 are adapted to be adjusted with relation to the center of the body 9, wherein is formed an opening 16 which fits the upper projecting end portion 17 of the transmission means and shaft 18, so that the plate or body 9 will be in close electrical contact with said shaft 18. The outer end portion 19 of the member 12 may be adjusted from the opening 16 and the upper end 17 of the shaft 18, over the surface of the record E, to the desired degree, with relation to the phase of the traverse of the record by the needle *f* at which it is desired that the needle contact with the circuit maker K to stop the rotation of the table D and the record thereon, and terminate the operation of the sound producing apparatus. The outer end 19 of the member 12 is preferably bifurcated or forked as shown, and a groove or crease 20 is formed in the upper surface of all of the members 10, 11 and 12, in continuous extension, from the forked end portion 19 to the inner end of the member 10, and thence the groove or crease 20 is extended in a groove or crease 20<sup>a</sup>, which approaches the opening 16 spirally, and dies out into a groove or crease 20<sup>b</sup> circular in form and concentric with the opening 16.

The operation, method of use and advantages of the improvements in sound producing apparatus, and means for throwing the same out of operation, constituting the invention, will be readily understood from the foregoing description taken in connection with the accompanying drawings and the following statement:—When the operation of the sound producing apparatus is commenced, or before the same is com-

menced, the member 12 of the guide *k* is moved outwardly with relation to the center of the body 9, which is at the center of the record E, such body 9 and record E and table D being centered upon the upper end 17 of the shaft 18, so that the forked end 19 of the member 12 will be engaged by the needle *f* when the same has spirally traversed the record, in the customary manner, approximately to a pre-determined point, at which the termination of the operation of the sound producing apparatus is desired to be caused. The needle *f* is placed upon the record to initiate the production of the sequence of sounds constituting the rendition for which the record is organized, and the motor B is put into operation to rotate the table D, the record E and the circuit maker K. When the needle *f* contacts with the guide *k*, at the forked end 19, a closed electrical circuit is established through the needle, the arm G, the bracket H, the source of electrical supply L, the electro-magnetic means M, the motor B, the transmission means C, and the circuit maker K, an open electrical circuit having theretofore been present in and through such parts and features and the circuit wires joining the same electrically. The closed electrical circuit through the electro-magnetic means M causes the actuation of the armature *m* thereof toward the periphery of the table D, and when brought into engagement therewith rotation of the table and of the record E is retarded and finally checked, the motor being thus stopped through the transmission means C. Previous to final stoppage of motion of the parts of the apparatus as last described, the needle *f* moves somewhat, such movement being accommodated by the grooves or creases 20, 20<sup>a</sup> and 20<sup>b</sup>, one or all of which the needle traverses until it finally comes to rest upon complete stoppage of the motor. The armature *m* thus constitutes a brake for the motor B, the table D and the other parts actuated and moved by the motor, preventing, in its action upon the table D, further rotation of the table and the record thereon and the circuit maker K upon the record, and therefore preventing further relative movement of the needle *f* and the record, thereby terminating sound production by the apparatus. Where means are not employed to throw the apparatus out of operation at the termination of a rendition thereby, the operation is continued until the motor has expended its energy, and such operation is customarily accompanied by raucous sounds devoid of tonal inter-relation or effect. Such expenditure of motive energy and creation of sounds after the rendition has been completed, are prevented and obviated by the use of the improved means described for throwing out of operation the sound producing apparatus

and the actuating means therefor; and it may be noted that the guide *k*, because of its adjustability, may be so disposed with relation to the center of the record *E* as to cause termination of operation of the apparatus at any pre-determined phase thereof, or substantially at any pre-determined point in the rendition of the selection for which the record is organized.

10 In equipping or providing sound producing apparatus of standard or conventional types with the improvements constituting the invention, very slight alterations are necessary, comprising in the main the installation of the electro-magnetic means *M*, the source of electrical supply *L*, the circuit maker *K*, and the several circuit wires for electrically connecting the parts.

It will be understood that the brake ordinarily provided for stopping the operation of the apparatus, and manually controlled, may be retained for use in connection with the improvements constituting the invention, so that the apparatus may be maintained inoperative during the changing of records, and previous to commencing the sound production. Such retention of the brake customarily employed is optional, as will be manifest. The apparatus provided with the improvements is neat in appearance, no additional features being visible which are of any substantial bulk or which to any extent are cumbersome or mar the symmetry and general appearance of the apparatus.

I do not desire to be understood as limiting myself to the specific provision, construction, formation, combination, and association of parts, members and features shown and described; but reserve the right to vary the same, in adapting the improve-

ments to varying conditions of use, without departing from the spirit of the invention and the terms of the following claims.

Having thus described my invention I claim and desire to secure by Letters Patent:—

1. In apparatus of the character described, a movable sound record support, the sound record thereon, a needle co-acting with the sound record in the production of sound, an adjustable support for the needle, a circuit maker co-acting with the needle, a brake adapted to be applied to terminate movement of the movable sound record support, and electro-magnetic means controlling the brake and electrically connected with the circuit maker; said circuit maker comprising a body adapted to be mounted upon the sound record, and a plurality of adjustably connected members adjustably connected with the body; one of said adjustably connected members being provided with a bifurcated end portion, there being a groove extending therefrom continuously throughout all of said members and a groove upon said body merging into said first named groove.

2. In apparatus of the character described, a circuit maker comprising a plurality of adjustably connected members, one of said members being provided with a bifurcated end portion, there being a groove extending therefrom continuously throughout all of said members.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

RICHARD A. WHITEHEAD.

Witnesses:

ELIZABETH C. MOESKES,  
CHARLES D. WARDEN.



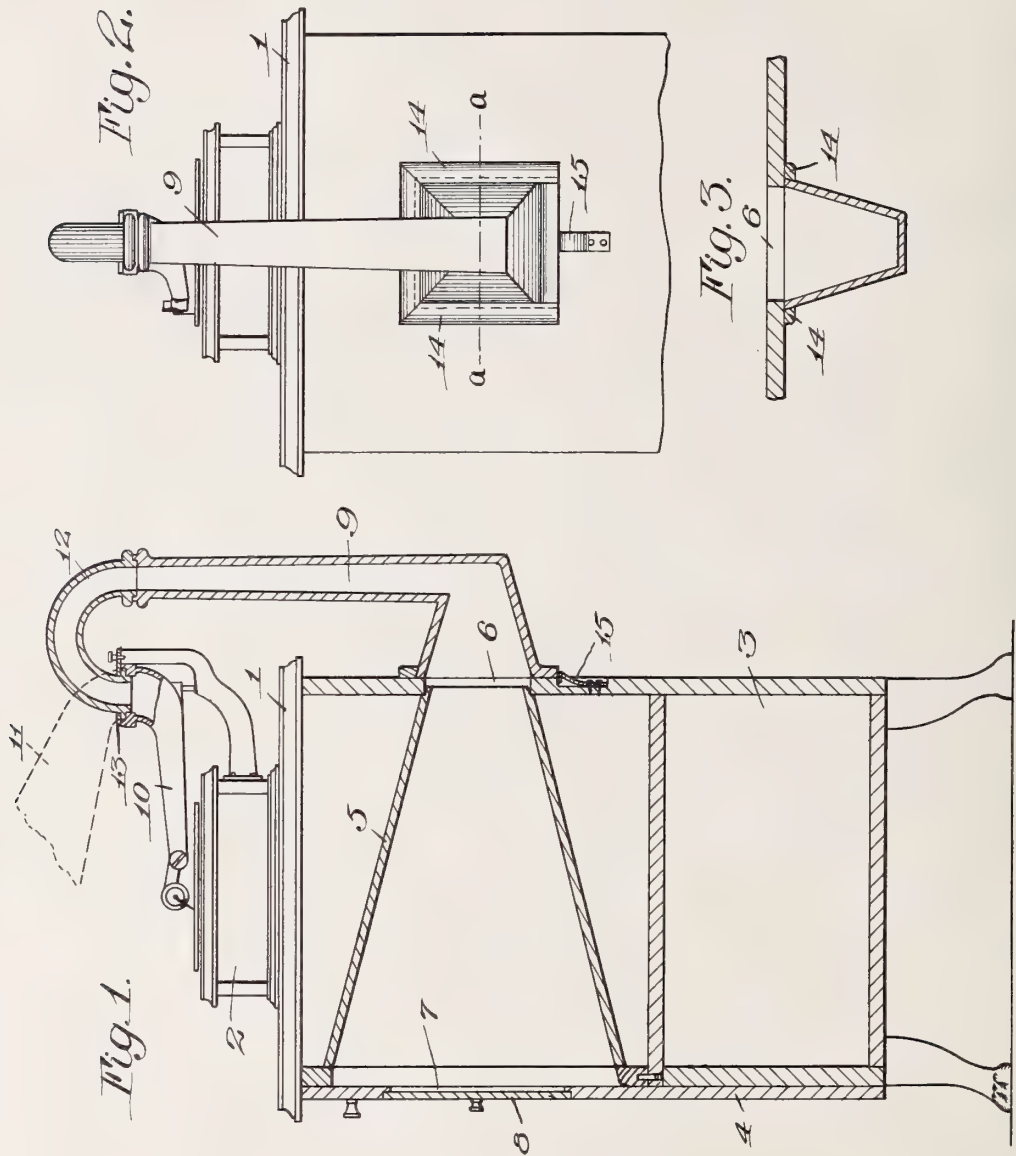




A. CASAGRANDE.  
STAND FOR TALKING MACHINES.  
APPLICATION FILED MAY 29, 1911.

1,017,848.

Patented Feb. 20, 1912.



Witnesses  
Ada M. Whitmore.  
John C. Culom

Inventor  
Annibal Casagrande  
By J. H. Linn  
his Attorney

# UNITED STATES PATENT OFFICE.

ANNIBAL CASAGRANDE, OF ROCHESTER, NEW YORK.

STAND FOR TALKING-MACHINES.

1,017,848.

Specification of Letters Patent.

Patented Feb. 20, 1912.

Application filed May 29, 1911. Serial No. 630,143.

*To all whom it may concern.*

Be it known that I, ANNIBAL CASAGRANDE, of Rochester, in the county of Monroe and State of New York, have invented a new and  
5 useful Improvement in Stands for Talking-Machines, which improvement is fully set forth in the following specification and shown in the accompanying drawings.

The present invention relates to stands for  
10 talking machines and an object thereof is to provide a construction adapted to support an ordinary talking machine of the type having a horn projecting forwardly there-  
15 from above the machine, provision being made for connecting the tapering tone tube of a talking machine to a horn which is arranged on the stand below the supporting part thereof.

To these and other ends the invention consists in certain parts and combinations of parts all of which will be hereinafter described, the novel features being pointed out  
20 in the appended claims.

In the drawings: Figure 1 is a vertical  
25 section through a stand constructed in accordance with this invention; Fig. 2 is a rear view of the upper portion of the stand; and Fig. 3 is a section on a line *a-a* Fig. 2.

In the illustrated embodiment of the in-  
30 vention the stand is in the form of a cabinet whose top 1 serves as a supporting part for a talking machine 2. The cabinet may have any number of compartments such as the compartment 3 for storing records, tools or  
35 other articles used in connection with a talking machine, said compartments being reached preferably through a door 4 at the front of the cabinet. Also arranged in the cabinet below the top surface or supporting  
40 part 1 is a horn 5 preferably rectangular in cross section and formed of wood or other suitable material. This horn preferably is held horizontally within the cabinet and connects an inlet opening 6 in the rear wall  
45 to an outlet or discharge opening 7 which may be formed in the front wall or door 4 and adapted to be closed by one or more doors 8, in this instance hinged to the door 4 and adapted to modulate the sound issuing  
50 from the horn 5.

Connecting with the horn 5 at the inlet or intake 6 is a horn extension 9 which projects rearwardly and upwardly from the in-  
55 take so that its upper end lies above the supporting surface 1 and preferably substantially in a plane with the upper end of the

tapering tone tube 10 of a talking machine supported on the top; the horn 11 being detachably secured to the tube 10.

Connection between the upright extension 60 9 and the tapering tone tube 10 may be established, when the horn 11 is removed, by means of a connection 12 preferably in the form of an inverted U-shaped elbow, one end of which is formed to fit tightly the upper  
65 end of the extension 9 while the other end seats in the upper end of the tapering tone tube 10 and is held to the latter by the securing device 13 which is usually employed for securing the horn to the said tone tube. 70

It is preferred to detachably connect the horn extension 9 to the cabinet in order that said extension may be removed for the purpose of deceiving people as to the character of the cabinet. In other words, when this  
75 horn extension is removed, the cabinet has the appearance of an ordinary cabinet for sheet music. In this embodiment of the invention, guides 14 are provided about the opening 6 on the rear wall of the cabinet to  
80 receive the flared walls of the horn extension 9 and guide said extension to and from the opening. The extension is held in operative position by any suitable means, but in this instance a spring catch 15 arranged on the  
85 rear wall below the opening coöperates with the under side of the extension 9 after the latter is in coöperative relation with the opening 6.

In the use of the invention, a talking ma- 90 chine, of the type illustrated, is placed upon the supporting part 1 with its horn 11 removed. The extension 9 is connected to the rear wall of the cabinet by sliding the same upwardly over the catch 15 into coöpera- 95 tion with the guides 14 until the opening 6 is covered, when the catch 15 engages the extension 9 and holds the latter in position. The elbow 12 is then seated upon the upper end of the extension 9 and is secured to the 100 tapering tone tube 10 in the manner before pointed out. Sound from the talking machine passes through the connection 12 and extension 9 into the horn 5, the door 8 controlling the discharge from the horn. 105

According to this invention, it is possible to manufacture an independent cabinet for talking machines which will have a horn connected thereto and controllable in such a manner as to modulate the music or sound 110 issuing from the talking machine. The connection between the talking machine and

the horn of the cabinet is such that it permits the entire upper surface of the cabinet to be used, while at the same time the connection may be detached for the purpose  
5 of deceiving people as to the character of the cabinet, thus permitting the latter to be used for the support of ornaments or articles other than talking machines.

10 What I claim as my invention and desire to secure by Letters Patent is:

1. A stand for a talking machine, comprising a supporting part, a horn arranged below the supporting part, a horn extension detachably mounted upon said supporting  
15 ing part independently of the horn and extending rearwardly and upwardly above said supporting part and outside thereof, said extension being disposed exteriorly of the space inclosed by said supporting  
20 part, means for detachably mounting one end of said extension independently of the horn, and an inverted detachable U-shaped connection with the other end of said extension, said connection being designed for

connection with the tone tube of a talking  
machine in lieu of the horn. 25

2. A stand for a talking machine, comprising a supporting part, a horn arranged below the supporting part, a horn extension detachably mounted upon said supporting  
30 part independently of the horn and extending rearwardly and upwardly above said supporting part and outside thereof, said extension being disposed exteriorly of the space inclosed by said supporting part, means for  
35 detachably mounting one end of said extension independently of the horn, an inverted detachable U-shaped connection with the other end of said extension, said connection being designed for connection with the  
40 tone tube of a talking machine in lieu of the horn, and a door to said supporting part opposite the larger end of said horn.

ANNIBAL CASAGRANDE.

Witnesses:

H. H. SIMMS,

A. M. WHITMORE.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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W. C. RUNGE.  
APPARATUS FOR FORMING IMPRESSIONS ON PHONOGRAPH RECORD BLANKS AND LIKE ARTICLES.

Patented Feb. 27, 1912.

May 9 Tremble  
Frank E. Kappeler

BY Dickerson Brown Raegener & Matty

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.



W. C. RUNGE.

APPARATUS FOR FORMING IMPRESSIONS ON PHONOGRAPH RECORD BLANKS AND LIKE ARTICLES.

APPLICATION FILED APR. 21, 1909.

1,018,631.

Patented Feb. 27, 1912.

4 SHEETS—SHEET 2.

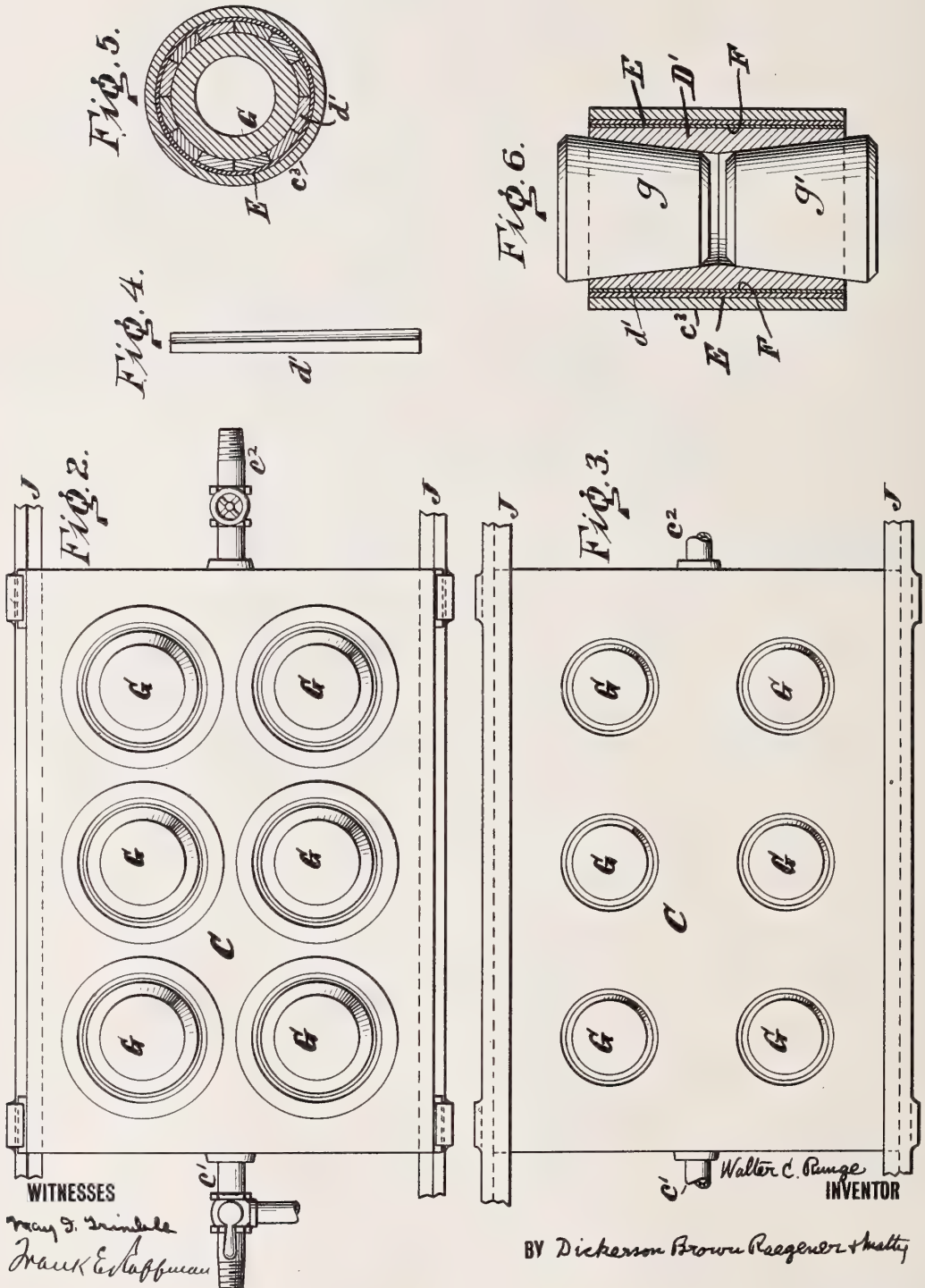






Fig. 8.

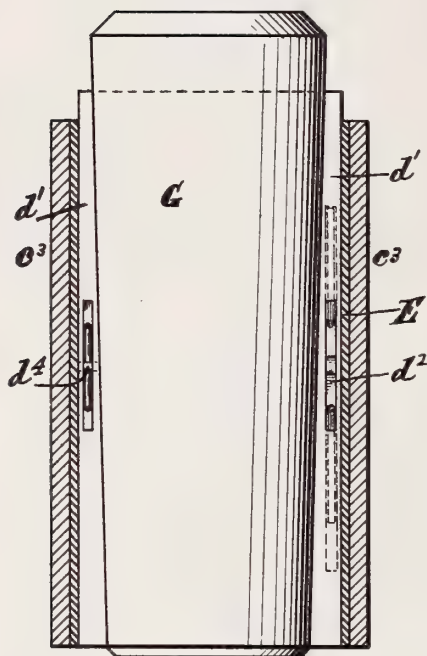


Fig. 9.

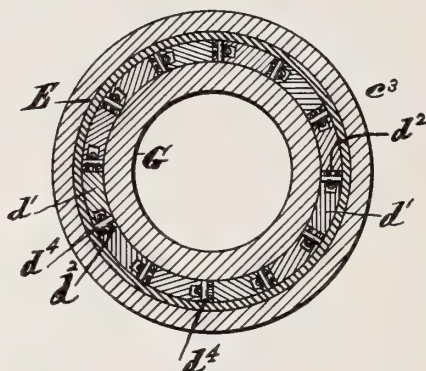
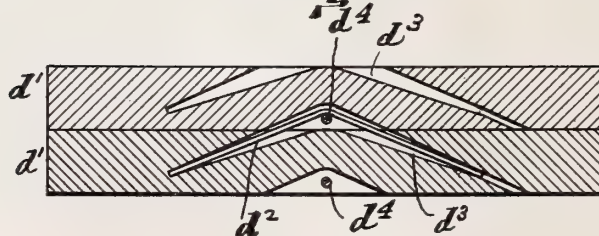


Fig. 10.



WITNESSES

May 9. 1912  
*Walter C. Runge*  
*Walter C. Runge*

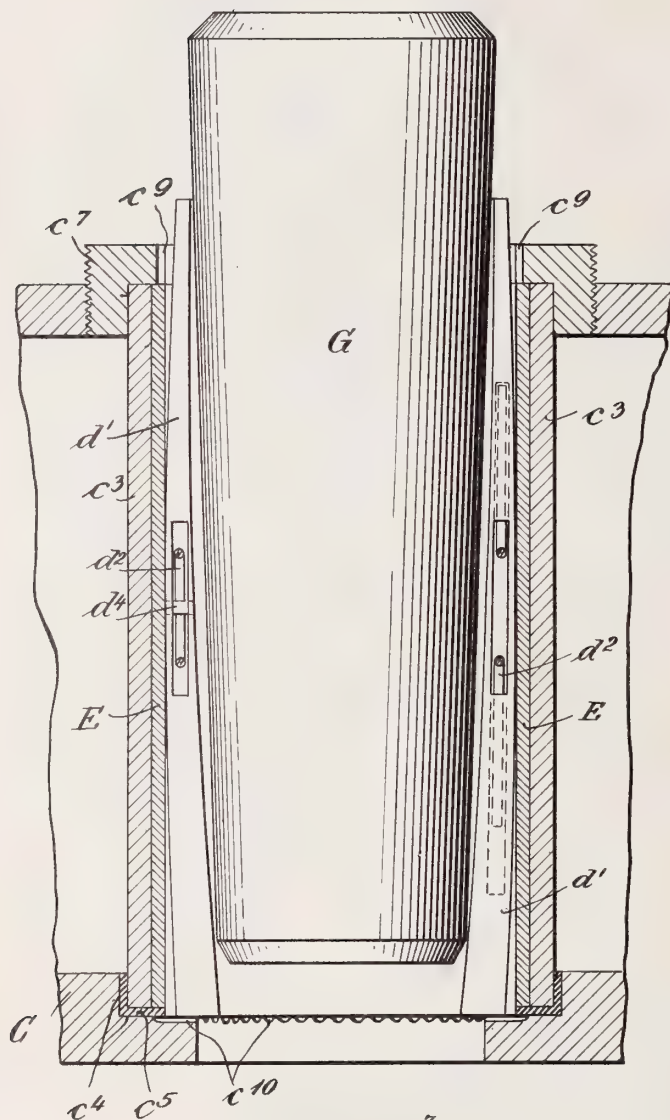
Walter C. Runge  
 INVENTOR

BY *Dickenson Brown Rasgauer & Maltz*

HIS ATTORNEYS



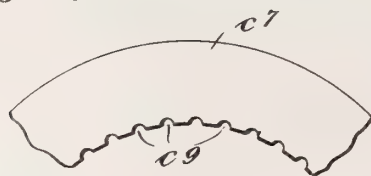
*Fig. 11.*



*Fig. 12.*



*Fig. 13.*



Witnesses:  
*Max B. A. Doring*  
*Paul H. Frank*

Inventor  
*Walter C. Runge*  
 By his Attorneys  
*Dickinson Brown Baggett*

# UNITED STATES PATENT OFFICE.

WALTER C. RUNGE, OF CAMDEN, NEW JERSEY, ASSIGNOR TO ROYAL PHONE AND PHONOGRAM COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MAINE.

## APPARATUS FOR FORMING IMPRESSIONS ON PHONOGRAPH-RECORD BLANKS AND LIKE ARTICLES.

1,018,631.

Specification of Letters Patent.

Patented Feb. 27, 1912.

Application filed April 21, 1909. Serial No. 491,223.

*To all whom it may concern:*

Be it known that I, WALTER C. RUNGE, a citizen of the United States, and a resident of the city of Camden, county of Camden, and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Forming Impressions on Phonograph-Record Blanks and Like Articles, of which the following is a specification.

My invention does not relate to the making of the blanks for phonograph records and like articles, but to the forming or impressing upon or into the same, of projections or recesses for the tune or other matter which is to be reproduced from the record.

I will describe an apparatus used in carrying out my invention, and then enumerate the novel features in claims.

In the accompanying drawings: Figure 1 is a vertical elevation partly in section, of an apparatus suitable for use in carrying out my invention. Fig. 2 is a top view of a tank and appurtenances comprised in the apparatus. Fig. 3 is an inverted or bottom view of the tank and appurtenances. Fig. 4 is a side view of a segment of an expander comprised in the apparatus. Fig. 5 is a transverse section of this expander. Fig. 6 is a longitudinal section of certain parts of a modified form. Fig. 7 is a side view of an apparatus for ejecting the expanders. Fig. 8 is an enlarged longitudinal section of parts shown also in Fig. 1. Fig. 9 is a central transverse section of these parts. Fig. 10 is a longitudinal section of parts of an expander. Figs. 11, 12 and 13 are views illustrating means whereby the expander is caused to exert pressure first at its middle portion and from there progressively toward the ends; Fig. 11 showing a longitudinal section of the parts, on a larger scale than the previous views, and with the mandrel G out of engagement with the staves of the expander, which latter are shown as curved or bowed; Fig. 12 is a detail elevation of one of these expander staves showing in full lines the normal or bowed condition of said stave and showing in dotted lines the straightened out condition of such stave, produced by the action of the mandrel; and Fig. 13 is a fragmentary top view of one of

the caps  $c^7$ , showing the openings  $c^9$  therein for the escape of air.

Similar letters of reference designate corresponding parts in all the figures.

The apparatus comprises a press which may be of any suitable form, having cylinders A and pistons provided with protruding rods B operated by fluid supplied by a pipe  $a^1$  under control of suitable valve mechanism  $a^2$ . These cylinders and pistons may be of any suitable number. Preferably they will be operated independently to the extent that each may act upon the part which it is to operate to any degree that may be important, without requiring any other to operate to the same degree.

C designates a tank, here shown as of polygonal form, and provided with an inlet  $c^1$  and an outlet  $c^2$ . Extending between its top and bottom walls are tubes  $c^3$  which at their lower ends are shown as fitting into rabbets or recesses  $c^4$  formed in the bottom wall of the tank, with an interposed packing  $c^5$  of any suitable material to make a tight joint, and which at the upper end are shown as secured within openings  $c^6$  formed in the top wall of the tank by means of caps  $c^7$  provided externally with screw threads engaging with the top wall of the tank and having inwardly turned flanges overlapping the upper ends of the tubes, a suitable packing being preferably used between these parts to prevent leakage. The caps and tubes may be integral. It will be seen from this description that a fluid hot or cold, may by means of the inlet and outlet  $c^1$  and  $c^2$ , be circulated through the tank around its various tubes  $c^3$ .

The tubes  $c^3$  are either made to constitute matrices or else are provided with matrices. In the present instance they constitute matrices by themselves, being formed upon their inner surfaces so as to constitute negatives of records which are to be impressed upon phonograph cylinders or like articles.

Within the tubes  $c^3$  are tubular expanders D more particularly shown in Figs. 4 and 5, and these are so constructed as to be expandable for the purpose of forcing a record blank E which is introduced between each of them and the corresponding tubes  $c^3$  into the matrix of the latter. The bottom of the



tank C forms a stop for the tubular expanders D, preventing said expanders from moving longitudinally and so preventing stripping of the record blank E by longitudinal motion of said blank after it has engaged the surface of the matrix. This expander D may be composed of any suitable number of longitudinal sections  $d^1$  severally forming segments of a tube. In the present instance there are twelve of such sections and they are secured together by springs  $d^2$  at their longitudinal edges, but in such manner that adjacent segments may move toward and from each other. As here shown the springs  $d^2$  are bow shaped and engage with pins  $d^4$  inserted in the sections  $d^1$  and crossing recesses into which the middle portion of the springs extend but so that the ends of the springs may extend into recesses  $d^3$  formed in the next adjacent sections  $d^1$ . If found necessary, where records are to be formed upon thin material, the segments  $d^1$  of each expander D may have a surrounding sleeve F (see Fig. 6) of soft india rubber or similar material to prevent the edges of the sections  $d^1$  from forming ridges or grooves upon the material in which the record is to be made.

With each expander D a mandrel G is combined. It is longitudinally tapered and the inner surface of the expander D with which it is to coat, is similarly tapered so that when a mandrel G is forced longitudinally into an expander D the latter will be forced outwardly in a circumferential direction and therefore will force into the matrix of the corresponding tube  $c^3$  the material of a record blank E.

It will be understood that each cylinder A and piston B constitute an engine. There may be as many of these engines as there are tubes  $c^3$  and coating parts in a tank C so that when such a tank is pressed upon the bed of a press in such position that its mandrel G will be under the piston rods of the engines, the operation of the engines will cause the mandrels to move longitudinally in the proper direction to expand the expanders D and force the record blanks E outwardly into the matrices of the tubes  $c^3$ .

Before the mandrels G are operated in the manner just described, the tank is supplied with a heating medium which will preferably be hot water introduced through the inlet  $c^1$  and maintained in the tank for a time long enough to make the record blanks sufficiently plastic to receive clear and well defined impressions from the matrices of the tubes  $c^3$ . After the removal of a tank C from the press, a cooling medium is to be introduced into it and this may be cold water. If the cold water is introduced through the inlet  $c^1$  it will force out the hot water and afterward cool the finished records so that they will be disengaged circumferentially from

the matrices by contraction. The mandrels G will then be removed. This may be done by a separate press H (see Fig. 7) having pistons movable upward into holes  $c^8$  in the bottom of the tank and concentric with the tubes  $c^3$ . A separate press is, however, unnecessary because the tank may be turned upside down if its bed is provided with suitable holes, and the pistons B acting upon the smaller ends of the mandrels G may then be used to eject the mandrels. After the removal of the mandrels G the contracted expanders D may be taken out and afterward the finished records E may be removed.

Whenever different matrices  $c^3$  are to be used in a tank, the previously used ones may be removed by detaching the caps  $c^7$ . Afterward by a reversal of the described operations new matrices may be secured in the tank.

By having for each press several tanks of the kind described supported on slideways J, it will be possible to get one ready for the press while a second is in the press and while a third is having finished records removed from it. They may be moved along slideways J.

I have shown one of the piston rods as provided with an equalizing bar  $b^1$  which is pivoted between its ends by a pin  $b^2$  to the piston rod, and made of sufficient length so that its ends may impinge upon two of the mandrels G. By this means the number of engines is reduced to one half what would otherwise be necessary and withal an independent operation of each mandrel of a pair is secured.

In Fig. 6 I have shown two mandrels  $g^1$  and  $g^2$  tapering longitudinally toward their adjacent ends and with them is combined an expander D<sup>1</sup> which tapers from each end toward the center. These mandrels will each be operated in the same manner as the single mandrel comprised in the main example of my invention.

To insure escape of air, the segments of the expanders are preferably longitudinally bowed, as indicated particularly in Figs. 11 and 12, so that when the taper mandrel G, in its descent, acts upon said segments or staves, these segments first act upon the record blank near the middle thereof, and thence act thereon progressively toward the ends, thereby forcing out any air which may be between the expander and the record.

The caps of the matrix tubes  $c^3$  may be provided with holes  $c^9$  for escape of air, and there may be radially arranged air escape recesses  $c^{10}$  in the upper surfaces of the rabbets  $c^4$ .

What I claim is:—

1. A tubular matrix, a container therefor, a tubular expander arranged within the matrix, said matrix container forming a stop

for said expander preventing longitudinal motion thereof, and a mandrel arranged within the expander, all being so combined that a record blank for a phonograph or like article may be arranged between the matrix and expander, and that the mandrel by acting on the expander may produce pressure for forming a record upon the record blank.

2. A tubular matrix, a container therefor, a tubular expander made of a number of longitudinal sections yieldingly connected together and arranged within the matrix, said matrix container forming a stop for said expander preventing longitudinal motion thereof, and a mandrel arranged within the expander, all being so combined that a record blank for a phonograph or like article may be arranged between the matrix and the expander, and that the mandrel may produce pressure for forming a record upon the record blank.

3. A tubular matrix, a tubular expander made of a number of longitudinal sections made of resilient material, formed so as to be normally protuberant externally intermediate of their ends, yieldingly connected together and arranged within the matrix, and a mandrel arranged within the expander, all being so combined that a record blank for a phonograph or like article may be arranged between the matrix and the expander, and that the mandrel may produce pressure for forming a record upon the record blank.

4. A tubular matrix, a container therefor, a tubular expander made of a number of longitudinal sections connected together at their adjacent edges by springs and arranged within the matrix, said matrix container

forming a stop for said expander preventing longitudinal motion thereof, and a mandrel arranged within the expander, all being so combined that a record blank for a phonograph or like article may be arranged between the matrix and the expander, and that the mandrel may produce pressure for forming a record upon the record blank.

5. A tubular matrix, a container therefor, a tubular expander made of a number of longitudinal sections surrounded by an elastic sleeve and arranged within the matrix, said matrix container forming a stop for said expander preventing longitudinal motion thereof, and a mandrel arranged within the expander, all being so combined that a record blank for a phonograph or like article may be arranged between the matrix and the expander, and that the mandrel may produce pressure for forming a record upon the record blank.

6. A tubular matrix, a container therefor, a tubular expander arranged within the matrix, said matrix container forming a stop for said expander preventing longitudinal motion thereof, and a longitudinally tapering mandrel arranged within the expander, all being so combined that a record blank for a phonograph or like article may be arranged between the matrix and the expander, and that the mandrel may produce pressure for forming a record upon the record blank.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WALTER C. RUNGE.

Witnesses:

FRANK E. RAFFMAN,  
PAUL H. FRANK.



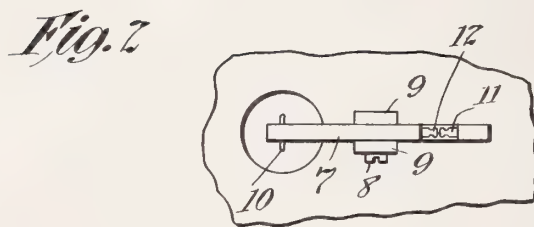
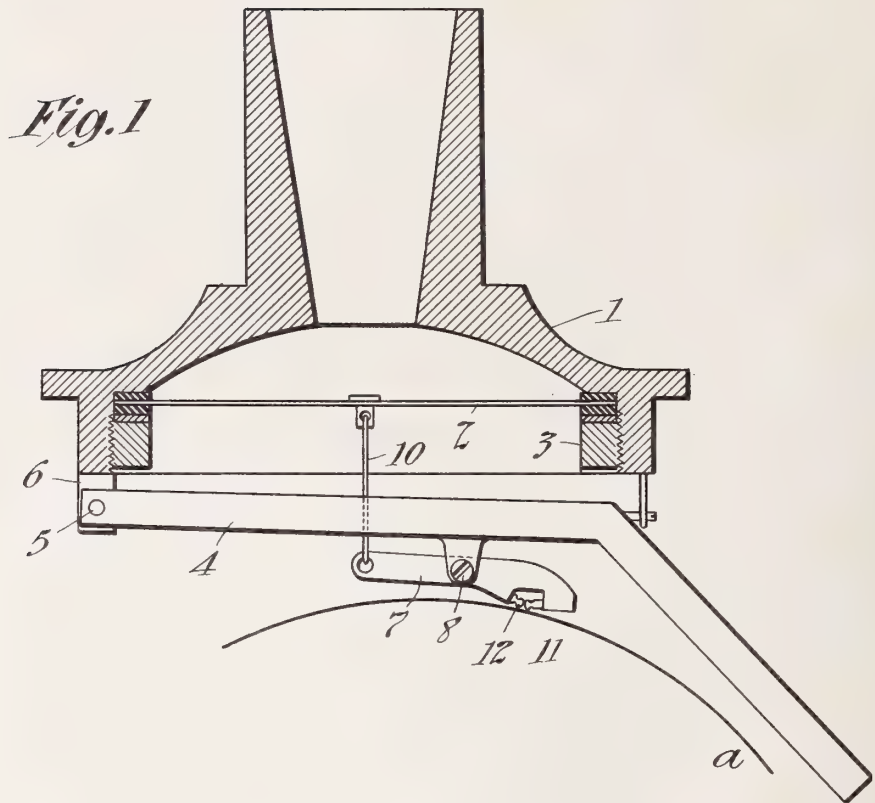




T. A. EDISON.  
 PHONOGRAPH REPRODUCER.  
 APPLICATION FILED JUNE 11, 1908.

1,019,440.

Patented Mar. 5, 1912.



*Witnesses:*  
 Frank Owen  
 Herbert H. Dyke

*Inventor:*  
 Thomas A. Edison  
 by Frank L. Over  
 Atty.

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, ORANGE, NEW JERSEY, ASSIGNOR TO  
THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH-REPRODUCER.

1,019,440.

Specification of Letters Patent.

Patented Mar. 5, 1912.

Application filed June 11, 1908. Serial No. 437,843.

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Reproducers, of which the following is a description.

My invention relates to reproducers for phonographs and more particularly to that type which is adapted to operate upon a sound record in the form of a groove having elevations and depressions corresponding to the original sound waves.

The object of my invention is to secure a louder and more perfect reproduction than can be obtained from the ordinary form of reproducer, or to secure a reproduction of equal loudness with less wear upon the record. With this end in view I employ a pair of reproducer styluses, one of which is arranged slightly in advance of the other with respect to the record groove, so that both styluses track the same groove together, and although the one stylus is slightly in advance it does not interfere with the other because of the elongated character of the record groove. In other words, each sound or note which is recorded on the record consists of so many elevations and depressions that the two styluses are operated practically simultaneously with respect to the record of each individual sound, however minute.

Reference is hereby made to the accompanying drawing, of which—

Figure 1 is a side elevation, partly in section, of a phonograph reproducer constructed in accordance with my invention, and Fig. 2 is a bottom plan view of the stylus lever, styluses and a portion of the floating weight.

The reproducer shown comprises a sound box body 1 of ordinary form, within which the diaphragm 2 is clamped by the ring 3 in the usual manner. The floating weight 4 is pivoted at 5 to the block 6 carried by the body 1, and the stylus lever 7 is pivoted on the screw 8 carried by the lugs 9 which

depend from the weight 4. One end of the lever 7 is connected by the link 10 to the center of the diaphragm 2, and the other end of the lever is provided with a pair of sockets which receive the reproducer styluses 11 and 12, the former being slightly in advance of the latter with respect to the groove of the sound record *a*. These styluses may be of any form adapted to track the said groove, but I have shown and prefer to use styluses of the type known as button-balls, as fully set forth in my patent reissue No. 11,857, dated September 25, 1900.

Having now described my invention, what I claim is:

1. In a phonograph reproducer, the combination with a vibratory member, of a pair of reproducing styluses adapted to coact with a sound record, means for supporting said styluses in position to track the same groove of a sound record, said styluses being positioned sufficiently closely together to be operated in the reproduction of the record substantially simultaneously by the same note recorded on the record, but not to interfere with each other, and means for transferring the vibrations of said styluses to said vibratory member, substantially as described.

2. In a phonograph reproducer, the combination with a vibratory member, of a stylus lever connected to said member and a pair of reproducing styluses carried by said lever, adapted to coact with a sound record and track the same groove, said styluses being supported with their operative surfaces located in substantially the same plane parallel to the grooves of said sound record when the reproducer and record are in operative position and in substantially the same plane tangent to said record, substantially as described.

3. In a phonograph reproducer, the combination with a vibratory member, of a floating weight, a stylus lever carried by said weight and connected to said member and a pair of styluses carried by said lever, adapted to coact with a sound record, said styluses

being supported with their operative surfaces located in substantially the same plane parallel to the grooves of said sound record when the reproducer and record are in operative position and in substantially the same plane tangent to said record, substantially as described.

This specification signed and witnessed this 8th day of June 1908.

THOS. A. EDISON.

Witnesses:

FRANK L. DYER,  
FRANK D. LEWIS.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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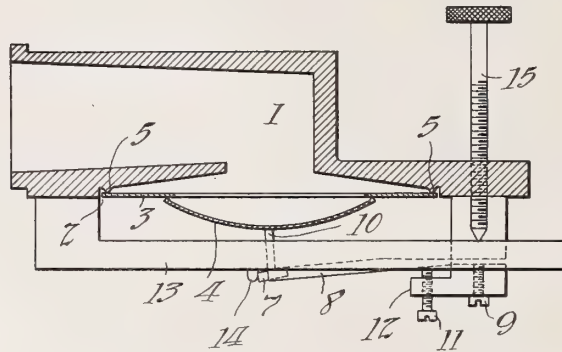


T. A. EDISON.  
SOUND RECORDING APPARATUS.  
APPLICATION FILED APR. 20, 1910.

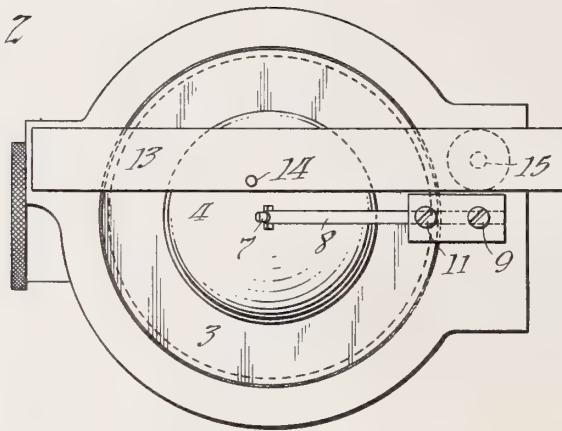
1,019,441.

Patented Mar. 5, 1912.

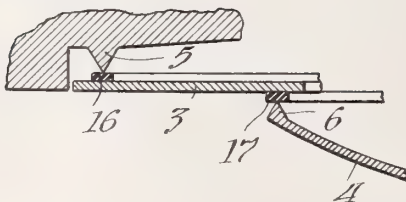
*Fig. 1*



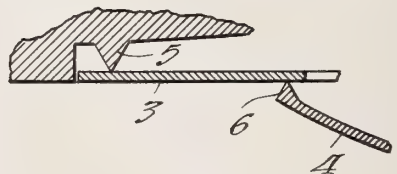
*Fig. 2*



*Fig. 4*



*Fig. 3*



*Witnesses:*  
Frank D. Lewis  
Dyer Smith

*Inventor:*  
Thomas A. Edison  
by Frank L. Dyer  
his Atty.

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, WEST ORANGE, NEW JERSEY, ASSIGNOR  
TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A COR-  
PORATION OF NEW JERSEY.

## SOUND-RECORDING APPARATUS.

1,019,441.

Specification of Letters Patent.

Patented Mar. 5, 1912.

Application filed April 20, 1910. Serial No. 556,469.

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, West Orange, Essex  
5 county, New Jersey, have invented certain new and useful Improvements in Sound-Recording Apparatus, of which the following is a description.

My invention relates to devices for recording  
10 ing sound, and my objects are the provision of a novel and efficient sound recorder of sufficient sensitiveness to respond to sound waves of little power, and at the same time so constructed as to largely prevent excessive  
15 movement of the diaphragm and recording stylus in a direction away from the recording surface under the influence of sound waves of great amplitude. My improved apparatus therefore is intended to record  
20 sounds, both weak and strong, more truly than has heretofore been possible.

In order that a full understanding of my invention may be had, attention is hereby directed to the accompanying drawings  
25 forming part of this specification, and in which—

Figure 1 represents a vertical central cross section through a sound recorder embodying one form of my invention. Fig. 2 is a bot-  
30 tom plan view thereof. Fig. 3 is a sectional detail view showing the preferred manner of mounting the diaphragm; and Fig. 4 is a similar view showing a modified mounting for the diaphragm.

35 The same reference characters will be used throughout to denote corresponding parts.

Referring to the drawings, the sound box 1 is provided with a recess 2 to receive and guide the diaphragm. The latter consists  
40 of a flexible outer portion preferably annular or ring shaped, as shown at 3 in the drawings, and an inner non-flexible portion 4. The flexible ring 3 which may consist of glass, mica, or other suitable material, is  
45 placed within recess 2 of sound box 1 without touching the sides of the same, and is supported preferably by knife edge 5 extending downwardly from sound box 1 within recess 2, said knife edge being position-  
50 ed to engage the upper surface of the flexible ring 3 adjacent to the outer edge thereof. The ring 3 is not secured to the sound box by wax, rubber, or in any other

way as is usual in the art. The rigid or non-  
flexible portion 4 of the diaphragm is given 55 the form of an arch, as shown, or is formed in any other way so that it will not be flexed by the pulsations of the sound waves upon it. This rigid member 4 of the diaphragm is preferably circular in form with its edge 60 bent sharply upward, as shown at 6, and forming a knife edge contacting the lower side of the flexible ring 3 near the inner edge thereof. The recording stylus 7 is carried by spring lever 8, the other end of 65 which is flattened and secured within the sound box by screw 9.

In assembling the recorder the ring member 3 of the diaphragm is placed upon knife  
edge 5, being guided and located by the edge 70 of recess 2 of sound box 1, and the non-flexing member 4 of the diaphragm is then placed in position with its sharp peripheral edge 6 contacting the under side of ring 3 near its inner edge. A rigid connection 75 10 is then placed between the end of spring member 8 and the center of the rigid diaphragm member 4, the spring member 8 being given a strong inward flexure and the connecting member 10 then firmly se-  
80 cured, preferably by shellac, at its two ends to the diaphragm member 4 and the spring member 8. Screw 11 may be mounted as shown in shoulder 12 of the sound box with its ends contacting the under side of spring  
85 member 8, whereby the amount of flexure of spring member 8 may be adjusted.

Lever 13 carrying tracking member 14 may be used if desired, the screw 15 being  
90 mounted in the sound box with its lower end bearing upon the upper side of the free end of lever 13 to adjust the vertical position of tracking member 14 to regulate the depth of cut permissible for recording  
95 stylus 7.

In Fig. 4 I have illustrated a modification in which ring member 3 of the diaphragm is provided with a ring of rubber or similar  
yielding material 16 secured by cement or otherwise to its upper side adjacent the 100 outer edge to form a bearing surface for knife edge 5 of the sound box, and a similar ring 17 is secured to the under side of ring 3 adjacent its inner edge to form a bearing  
105 surface for the sharp edge 6 of the rigid member 4 of the diaphragm. This con-



struction is to permit the use of such material for flexible ring 3 as cannot be entirely freed of buckling around the edges, but I prefer to form the ring 3 of material free from buckles and to have knife edge 5 of the sound box and edge 6 of the rigid member 4 bear directly upon the flexible ring as shown in Fig. 3. The screw 11 pressing upon spring 8 bows the latter inwardly and forces the diaphragm upwardly sufficiently to give a strong initial upward tension to the latter.

The following points may be noted in connection with the diaphragm constructed as above described:—

First: Less power is consumed in vibrating it than in the case of diaphragms secured to the sound box by wax, rubber, or similar substance attached to the outer edge of the diaphragm, as has been the common practice heretofore, since power has necessarily been lost in stressing this securing device. Accordingly, my diaphragm is more sensitive.

Second: Less strength is required in a sound wave to be recorded to move the diaphragm a given distance than in the common recorder construction, since it does not flex in the center. The ring 3 is easily flexed because of its free inner edge.

Third: The diaphragm does not buckle in segments within the limits of the deflections given by the sound waves to be recorded.

Fourth: By employing a non-flexing center and a flexible ring diaphragm free at both edges, a strong upward stress can be given the whole diaphragm, which not only serves to hold it in place, but also strongly resists excessive movement of the diaphragm in a direction away from the recording surface.

When the recording stylus is tracked for the record, the movement of the diaphragm downward or toward the recording surface requires but little power, but the outward or upper movement of the same is greatly resisted by the strong initial flexing of the diaphragm which has been described. Accordingly, the tendency of strong sound waves or waves of large amplitude to cause the recording stylus to leave the record material is strongly resisted. With the form of diaphragm heretofore used in recorders, the initial flexing necessary to attain the effect described is not practicable on account of false motions given to the diaphragm which are recorded with sufficient amplitude to be audible in the record when reproduced. In the construction which I have described and illustrated, however, no false motions of sufficient amplitude to be audible on reproduction are given to the diaphragm.

It is to be understood that my invention is not limited to the exact construction above

described, but is as broad as the appended claims.

Having now described my invention, what I claim and desire to protect by Letters Patent is:

1. In sound recording apparatus, the combination with a flexible ring diaphragm and a non-flexible central member bridging the opening of the ring and in contact therewith, of a recording stylus connected to the non-flexible member, and means for applying an elastic pressure on the stylus to hold the flexible and non-flexible members in engagement, substantially as described.

2. In sound recording apparatus, the combination of a knife edge support, a two-part diaphragm, comprising a flexible ring member freely mounted on said support with the latter contacting the same adjacent to one edge thereof, and a non-flexible member bridging the opening of said ring and making contact therewith near the other edge thereof, a recording stylus, and a spring arm carrying the stylus and by its tension imposing an initial flexure on the diaphragm to keep the parts thereof in engagement and the ring member seated on said knife edge, substantially as described.

3. In sound recording apparatus, the combination with a sound box, of a flexible ring diaphragm mounted therein, a non-flexible member mounted to contact the inner edge of said ring but not attached thereto, and a recording stylus connected to said non-flexible member, substantially as described.

4. In sound recording apparatus, the combination with a sound box, of a diaphragm mounted therein comprising a flexible outer portion and a rigid inner portion, the outer edge of which contacts the inner edge of the flexible outer portion but is not attached thereto, and a recording stylus rigidly connected to said rigid inner portion of the diaphragm, substantially as described.

5. In sound recording apparatus, the combination with a supporting knife edge, of a diaphragm comprising a flexible ring mounted with its surface adjacent its outer edge contacting said knife edge, a non-flexible member mounted with its outer edge contacting the free inner edge of said ring but not attached thereto, and a recording stylus connected to said non-flexible member, substantially as described.

6. In sound recording apparatus, the combination with a knife-edge support, of a flexible annular diaphragm contacting said support near the outer edge of the annulus, and free at both edges, a non-flexible member the outer edge of which contacts the inner edge of said annulus on the side opposite to said support, a recording stylus connected to said non-flexible member, and means for holding said member in firm con-

tact with said annulus and placing the latter under initial upward stress, substantially as described.

7. In a device of the class described, the combination with a stylus, of a diaphragm connected thereto and comprising a rigid inner portion and a flexible outer portion adapted to vibrate with said inner portion but not secured thereto and maintained under an initial upward tension, substantially as described.

8. In a device of the class described, the combination with a stylus of a diaphragm connected thereto comprising a rigid inner portion and a flexible outer portion mounted to vibrate therewith and having a free inner edge and maintained under initial upward tension, substantially as described.

9. In a device of the class described the combination with a stylus, of a diaphragm connected thereto and comprising a rigid inner portion and a flexible outer portion adapted to vibrate with said inner portion but not secured thereto, a knife edge contacting the outer upper surface of the said outer portion, and means for placing the diaphragm under initial upward stress, substantially as described.

10. In sound recording apparatus, the combination with a recording stylus of a diaphragm connected thereto comprising a rigid inner portion and a flexible outer portion, a knife edge contacting the outer upper surface of the latter and constituting the

only support therefor, said inner portion having a sharp outer edge contacting the under side of the outer portion near the inner edge thereof but not joined thereto, and elastic means for holding the inner portion in contact with the outer portion of the diaphragm, substantially as described.

11. In a device of the class described, the combination with a sound box of a flexible diaphragm member mounted therein but not secured thereto, and having free edges, a non-flexible diaphragm member mounted to vibrate therewith, and a stylus connected thereto, substantially as described.

12. In a device of the class described, the combination with a sound box of a flexible annular diaphragm member mounted therein but not secured thereto, and having free edges, a support for said flexible member adjacent its edge, and a stylus connected to vibrate with said diaphragm member, substantially as described.

13. As a new article of manufacture, an inner non-flexible diaphragm member, provided with a sharpened edge for contact with a flexible annular diaphragm member, substantially as described.

This specification signed and witnessed this 14th day of April 1910.

THOMAS A. EDISON.

Witnesses:

PURSELL EGGLESTON,  
A. N. PIERMAN.







M. E. LEWIS.  
 AUTOMATIC PHONOGRAPH STOP.  
 APPLICATION FILED JUNE 10, 1911.

1,019,669.

Patented Mar. 5, 1912.

2 SHEETS—SHEET 1.

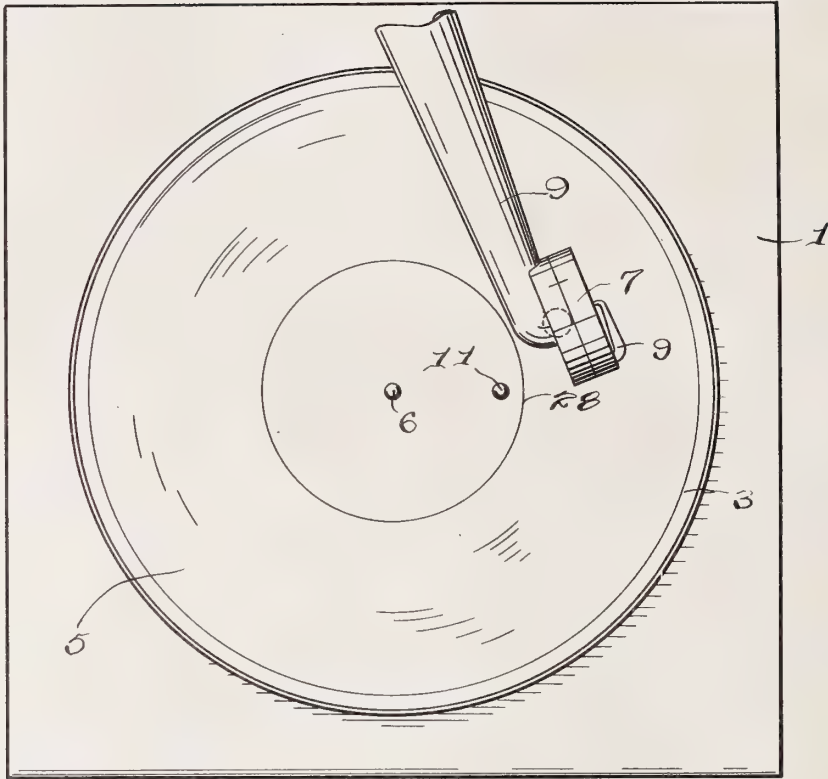


Fig. 1.

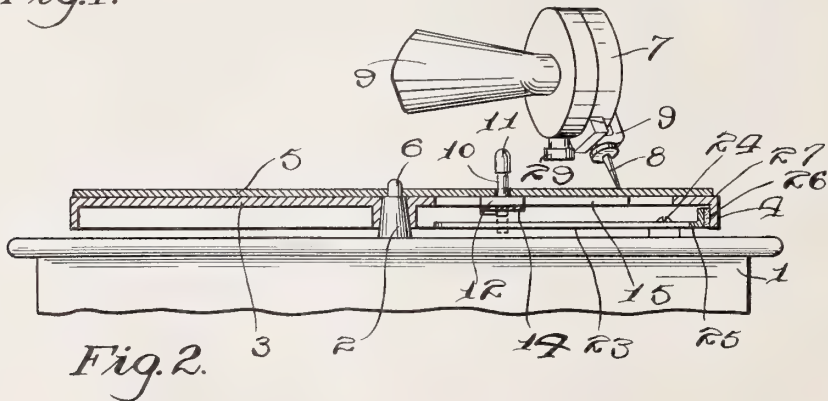


Fig. 2.

Inventor

Witnesses  
 H. A. Stock.  
 H. Q. Schroeder.

Milton E. Lewis  
 By E. C. Vrooman  
 his Attorney



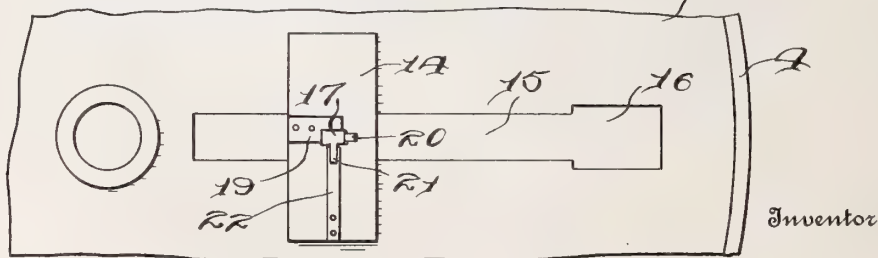
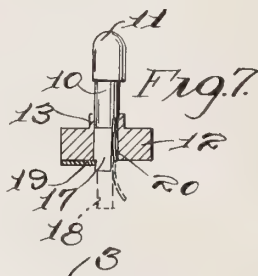
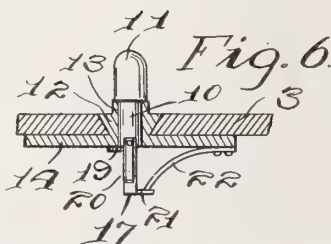
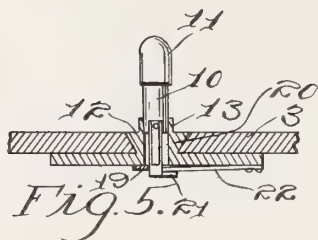
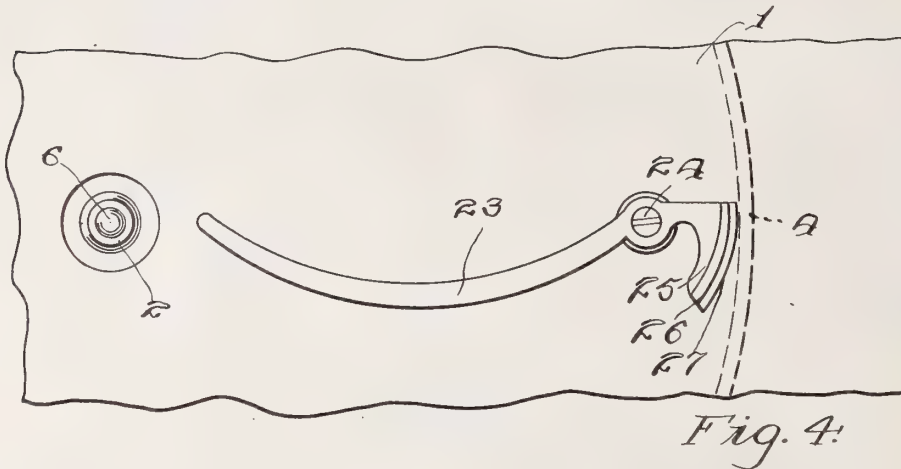
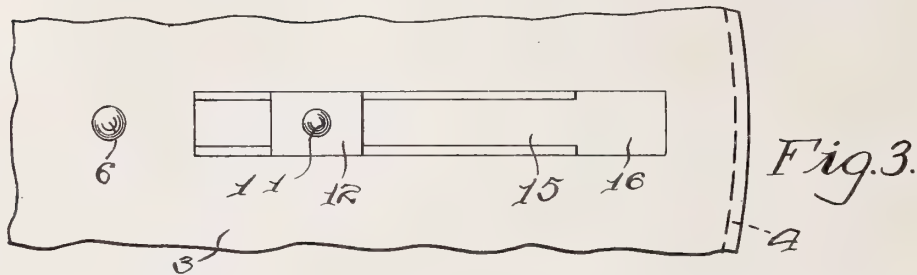


M. E. LEWIS.  
 AUTOMATIC PHONOGRAPH STOP.  
 APPLICATION FILED JUNE 10, 1911.

1,019,669.

Patented Mar. 5, 1912.

2 SHEETS—SHEET 2.



Witnesses  
 H. G. Stock  
 H. C. Schroeder

Milton E. Lewis  
 By E. C. Coonan,  
 his Attorney

# UNITED STATES PATENT OFFICE.

MILTON E. LEWIS, OF OAKLAND, CALIFORNIA.

AUTOMATIC PHONOGRAPH-STOP.

1,019,669.

Specification of Letters Patent.

Patented Mar. 5, 1912.

Application filed June 10, 1911. Serial No. 632,455.

*To all whom it may concern:*

Be it known that I, MILTON E. LEWIS, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Automatic Phonograph-Stops, of which the following is a specification.

This invention relates to phonographs and other similar sound producing machines and has for its object to provide an attachment therefor by means of which the machine may be automatically stopped when the end of the record is reached.

The attachment comprises in its general features a pin mounted on the revoluble disk of the machine and a projection on the transmitter which engages said pin when the end of the record is reached and causes the pin to engage a brake which acts upon the revolving plate to bring the machine to a stop.

Referring to the accompanying drawings:—Figure 1 is a plan view of a phonograph of the disk type, provided with an attachment constructed in accordance with this invention. Fig. 2 is a view of the top of the phonograph casing with the revoluble plate and a disk record thereon in cross section and a transmitter and a portion of its supporting arm. Fig. 3 is a detail view of an enlarged portion of the revoluble plate. Fig. 4 is an enlarged detail view of a portion of the top of the phonograph casing, looking at the upper side thereof and showing a brake employed with this invention. Fig. 5 is an enlarged detail view in cross section of a portion of a revoluble plate and an adjustable pin employed with this invention, shown in elevated position. Fig. 6 is a view similar to Fig. 5 showing the pin in lowered position. Fig. 7 is a detail view showing the pin in elevated position and the slidable support in which the pin is mounted. Fig. 8 is an enlarged detail view of the underside of a revoluble plate showing a portion of the adjustable device employed in connection with this invention.

In the accompanying drawings 1 indicates the upper part of a phonograph casing through which projects the spindle 2 which is connected with the operating mechanism, said spindle having mounted thereon a revoluble circular plate 3 having the depending flange 4 at its periphery. Resting upon the plate 3 is a disk record 5 held in place by

means of a pin 6 on the spindle 2. Located above the disk record 5 is a transmitter 7 having a stylus 8 mounted on the usual supporting arm 9.

Projecting through a hole in the record disk 5 adjacent to the end of the record is a pin 10 having a shouldered head 11, the pin 10 being located in a hole in a block 12 having an upwardly projecting portion 13 which serves as a stop for the shouldered head 11. The block 12 projects from a plate 14 located on the underside of the circular plate 3, the block 12 which has inclined sides being located in a longitudinal slot 15 in the plate 3 and having inclined sides conforming to the inclined sides of the block 12 whereby the latter is held in position in said slot and adapted to slide therein. At one end of the slot 15 is an opening 16 in the plate 3 which is wider than the slot 15 and through which the plate 14 is adapted to be passed to remove it from the plate 3. The pin 10 is provided with a rectangular extension 17 which is of less width than the hole through the plate 3 thereby permitting it to move laterally therein and the lower end of said extension 17 is provided with a notch 18 adapted to engage a plate 19 on the underside of the plate 3 and projecting slightly over the mouth of the hole in the plate 3, the extension 17 being held in locked engagement with the plate 19 by means of a spring 20 on the opposite side of the extension 17 which bears against one side of the hole in which the extension 17 is located. The pin 10 in its normal position is located in the hole in the block 12 with the extension 17 projecting below said hole and on the lower end of the extension 17 is a lateral projection 21 with which is engaged one end of a spring 22 secured to the plate 14.

Mounted on the top of the phonograph casing 1 is a brake consisting of a curved arm 23 pivoted at 24 to the upper side of the box 1 and provided with a curved brake head 25 having a cam shaped curved surface 26 on which a friction strip 27 adapted to bear against the flange 4 of the plate 3 is mounted.

The head 11 of the pin 10 is located as shown in Fig. 1 at a point adjacent to the end of the record as indicated by the line 28. Mounted on the transmitter 7 is a depending button shaped projection 29 which when the end of the record is reached engages the head 11 of the pin 10.

The operation of this device is as follows: Before the machine is started the pin 10 is pulled up from its normal position as shown in Fig. 6 to the position shown in Fig. 5, the pin being held in such position by the notch 18 in the extension 17 engaging the plate 19, as shown in Fig. 7. As the stylus approaches the end of the record the projection 29 advances toward the head 11 of the pin 10 and when the record is finished is brought into contact with the head 11 acting upon the pin to release the extension 17 from engagement with the plate 19, the extension 17 swinging over against the spring 20 and compressing the same. The spring 22 being under tension in the position shown in Fig. 5, when the extension 17 is released, the pin 10 is immediately pulled down to the position shown in Fig. 6. The extension 16 then strikes the brake arm 23 and thereby throws the brake 24 into engagement with the flange 4 of the plate 3 causing the machine to stop.

By means of the sliding block 12 and plate 14 the pin 10 may be adjusted for any length of record by adjusting the block 12 at a desired point in the slot 15.

What I claim is:—

1. In a sound producing machine of the kind described, a phonograph casing, a brake on the top of said casing, a revoluble plate on the top of said casing and above said brake and adapted to be engaged thereby, a block slidably mounted on said plate, a pin vertically movable in said block, means for holding said pin in elevated position, means for automatically lowering said pin, and a transmitter having a projection adapted to engage said pin and cause it to be released and drawn downward into engagement with said brake.

2. In a sound producing machine of the kind described, a phonograph casing, a brake having a brake arm pivoted thereto, and a cam shaped brake head, a revoluble plate mounted on top of said phonograph

casing above said brake and adapted to be engaged thereby, a block slidably mounted on said plate, a pin vertically movable in said block, a catch for holding said pin in elevated position controlled by a spring, a second spring for drawing down said pin when released from said catch, and a transmitter having a projection adapted to engage said pin and release the same to be drawn down by said spring into connection with said brake.

3. In a sound producing machine of the kind described, a phonograph casing, a spindle projecting through the top of the casing, a brake consisting of a lever arm pivoted to the top of said casing, and having one end located adjacent to said spindle, and a cam shaped brake head at its other end, a revoluble plate located above said brake having a depending flange adapted to be engaged thereby, a block slidably mounted in said revoluble plate and adjustable thereon and located adjacent to the central portion of the plate, a vertically movable pin located in said block, and having a reduced extension laterally movable in a hole in said block and provided with a notch on one side, and a spring on the other, a projection adapted to be engaged by said notch to hold said pin in elevated position, a lateral projection on said extension, a spring connected with said block engaging said projection and adapted to move said pin downward, and a transmitter having a projection adapted to engage said pin when the end of a record is reached, and release the same, and permit it to be drawn down by said spring into operative position to engage said brake arm.

In testimony whereof I affix my signature in presence of two witnesses.

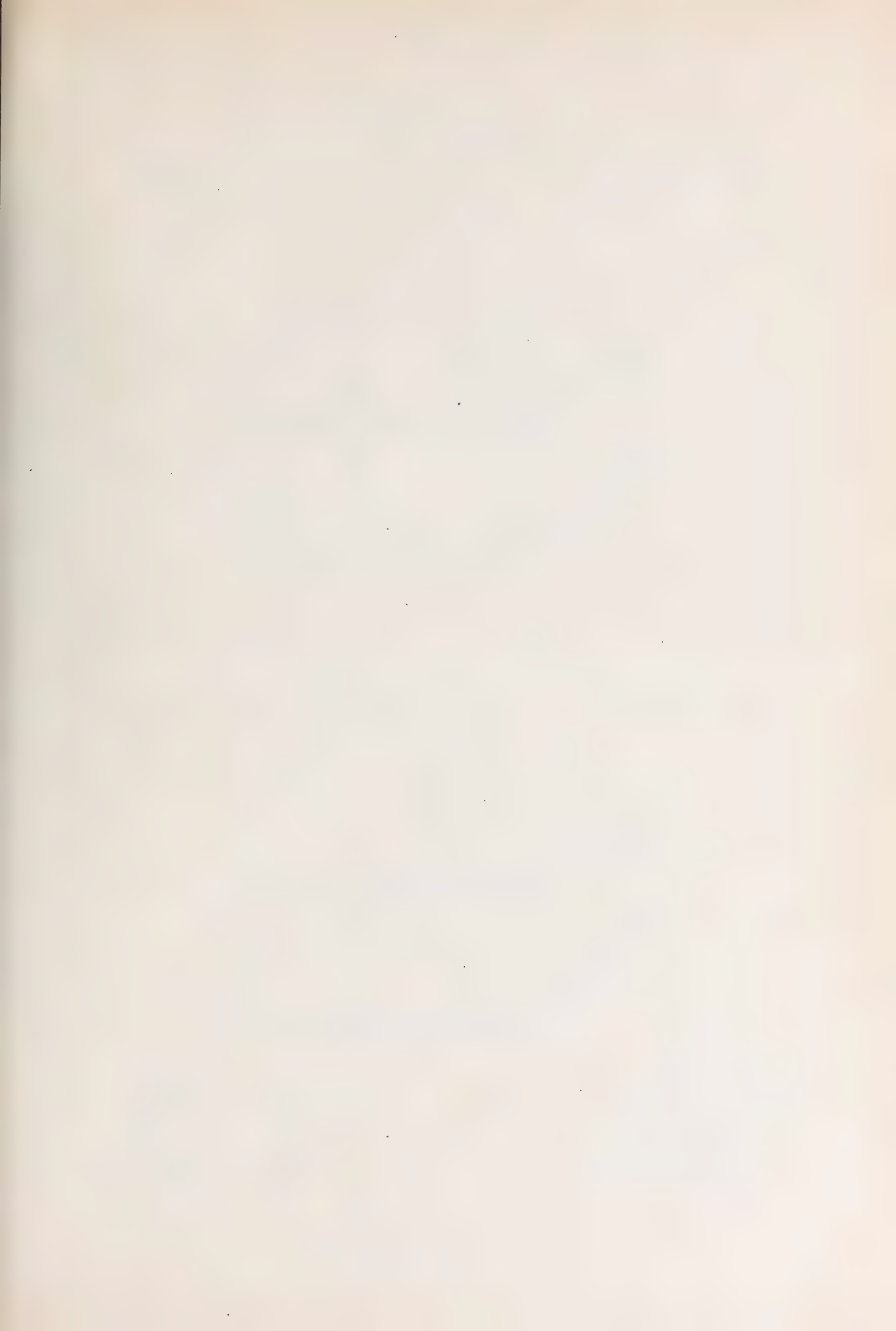
MILTON E. LEWIS.

Witnesses:

W. A. STOCK,

H. C. SCHROEDER.







V. E. D'URSO.  
SOUND AMPLIFIER FOR PHONOGRAPHS.  
APPLICATION FILED OCT. 24, 1911.

Reissued Mar. 5, 1912.

13,378.  
3 SHEETS—SHEET 1.

Fig. 1.

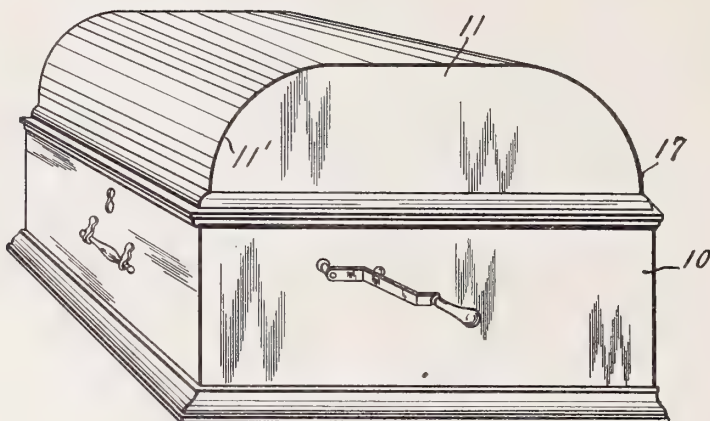
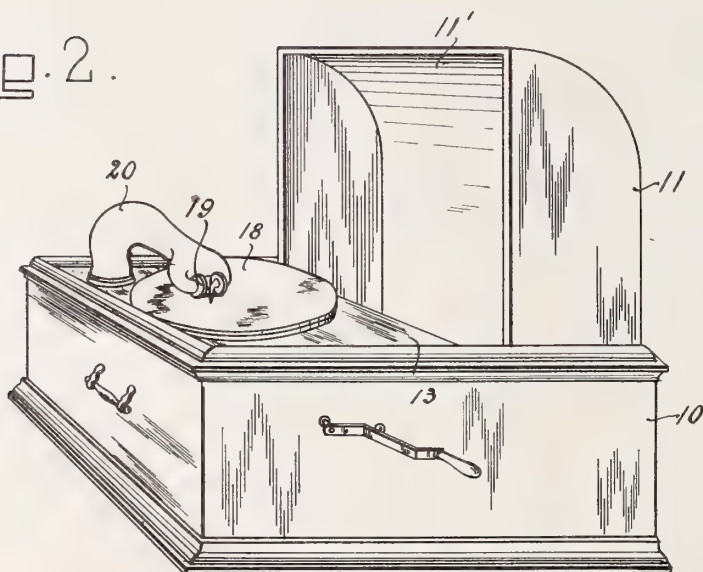


Fig. 2.



WITNESSES  
*W. Klink.*  
*S. Birnbaum*

INVENTOR  
*Vito Ettore D'Urso*  
by *Signumel Herzog*  
his ATTORNEY

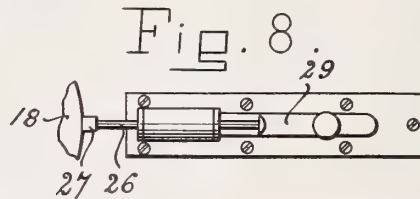
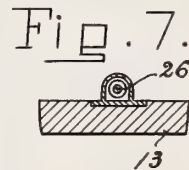
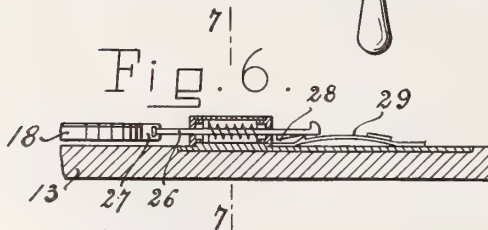
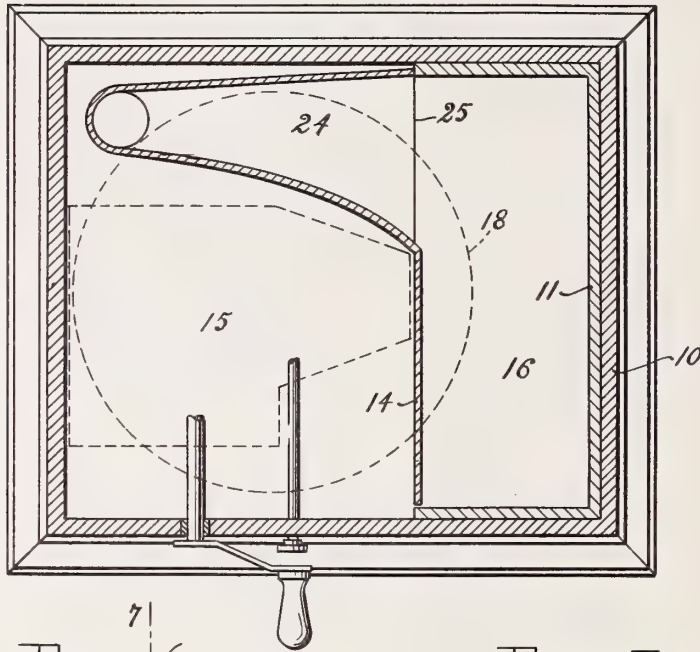


V. E. D'URSO.  
SOUND AMPLIFIER FOR PHONOGRAPHS.  
APPLICATION FILED OCT. 24, 1911.

Reissued Mar. 5, 1912.

13,378.  
3 SHEETS—SHEET 2.

Fig. 3.



WITNESSES  
Dr. Klink.  
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Vito Ettore D'Urso INVENTOR  
by Sigmund Herzog  
his ATTORNEY





V. E. D'URSO.  
SOUND AMPLIFIER FOR PHONOGRAPHS.  
APPLICATION FILED OCT. 24, 1911.

Reissued Mar. 5, 1912.

13,378.  
3 SHEETS—SHEET 3.

Fig. 4.

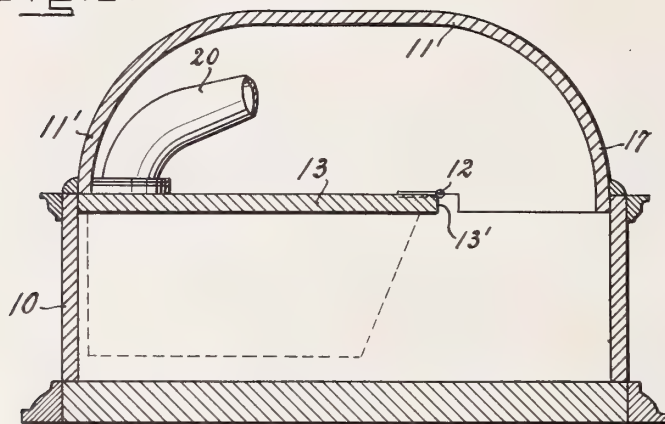
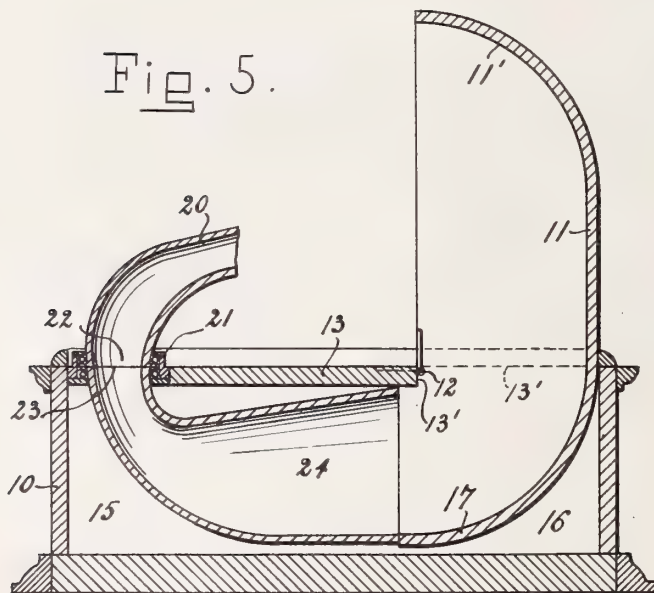


Fig. 5.



WITNESSES  
Dr. Flink.  
S. Birnbaum

INVENTOR  
Vito Ettore D'Urso  
by Sigmund Herzog  
his ATTORNEY

# UNITED STATES PATENT OFFICE.

VITO ETTORE D'URSO, OF NEW YORK, N. Y.

SOUND-AMPLIFIER FOR PHONOGRAPHS.

13,378.

Specification of Reissued Letters Patent. Reissued Mar. 5, 1912.

Original No. 956,235, dated April 26, 1910, Serial No. 521,247. Application for reissue filed October 24, 1911. Serial No. 656,553.

*To all whom it may concern.*

Be it known that I, VITO ETTORE D'URSO, a subject of the King of Italy, and a resident of the city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Sound-Amplifiers for Phonographs, of which the following is a specification.

The present invention relates to phonographs, and more particularly to a device for amplifying the sound resulting from the contact of the reproducer with the record.

Ordinarily there is used in connection with a reproducer of phonographic instruments a horn or similar device for amplifying the sound emanating from the reproducer. Such devices must necessarily be supported with reference to the disk or cylinder record, and owing to uncertain balance may affect the reproduction of the sound, causing improper action of the reproducer and a scarring of the record. Furthermore such horns, as have been commonly used, accentuate the mechanical sounds of the instrument and give a more or less "brassy" or "tinny" effect to the reverberations induced by the reproducer which passes over the record. Moreover, such devices are cumbersome and require adjustment with respect to the instrument, and must be applied to or removed from the instrument for the purposes of ordinary transportation.

One of the objects of the present invention is to provide a simple and compact device in which means arranged within the casing together with parts of the inclosing casing may be utilized as a sound amplifier.

Another object of the invention is to produce a device which will dispense with the ordinary horn type of amplifiers, which are usually arranged outside of the casing, and secure the necessary amplification of sound by utilizing a direct channel for the transmission of sound from the disk or record through the inclosing casing of the device.

A further object of the invention is to provide a casing for the mechanism of the instrument, which, in normal position, will

inclose the parts of the mechanism, and when opened for use will provide an additional amplifying or sound board effect, comprising a surface to which the sound waves conveyed by the main amplifying means are directed and by which the same are smoothly deflected.

With these and other objects in view, which will more fully appear as the nature of the invention is better understood, the same consists in the combination, arrangement and construction of parts hereinafter fully described, pointed out in the appended claims and illustrated in the accompanying drawings, it being understood that many changes may be made in the size and proportion of the several parts and details of construction without departing from the spirit or sacrificing any of the advantages of the invention.

One of the many possible embodiments of the invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a perspective view of a device constructed in accordance with the present invention in its closed position; Fig. 2 is a similar view of the apparatus in its open position; Fig. 3 is a horizontal section taken through Fig. 2, certain parts being broken away to more clearly show the invention; Fig. 4 is a central transverse section taken through the device in its closed position; Fig. 5 is a similar section through the device in its open position; Fig. 6 is a section taken through the stop for the record, Fig. 7 is a section taken on line 7—7 of Fig. 6; and Fig. 8 is a plan view of the mechanism illustrated in Fig. 6.

In the drawings, the numeral 10 indicates a casing which may be of ordinary rectangular form as shown herein, and is provided with a cover 11, hinged at 12, 12 to the bed- or top-plate 13 of the casing. The casing is divided by a partition 14 into two compartments, that is the compartment 15, in which are arranged the motor and the mechanism, not specifically shown herein, of the apparatus, and the compartment 16. The top-plate of the casing is provided with a rectangular opening 13', extending through



out the width of the casing and from the hinges 12, 12 to the rear wall thereof, to permit the rear end 17 of the cover 11, when opened, to pass down into the compartment 5 16 for a purpose which will be hereinafter described.

The record 18, shown in the form of a disk, is actuated by a motor and mechanism of any suitable type, and coöperates with a reproducer 19, carried by a tubular supporting arm 20, which is suitably arranged upon ball bearings 21 upon the top-plate 13 of the machine. The inner end 22 of the supporting arm 20 registers with an aperture 15 23 in the bed-plate, from which leads a tubular conduit 24 to an aperture 25 in the partition 14, connecting thereby the interior of the supporting arm with the compartment 16 in the casing. The conduit 24 increases gradually in diameter toward the aperture 25 in the partition 14, and registers there with the end 17 of the cover 11, when the latter is in its open position. The conduit 24 is thus, in fact, a sound amplifying horn or megaphone.

It should be observed that any form of reproducer may be utilized in connection with the device herein described and, of course, the motor and mechanical parts for rotating the disks or records of whatever form may be of any desired preferred or common type.

In Figs. 6 to 8, inclusive, is illustrated a form of a stop device for the record, which may be conveniently used in connection with the mechanism. This stop device consists of a plunger 26, having a face 27, adapted to come into or to be removed from contact with the supporting plate of the record. One end of the plunger is provided with a latch 28, which coöperates with a spring latch 29, and holds the plunger 26 in either of its positions of adjustment.

The operation of the device is as follows: When the cover is in its open position, it forms a continuation of the tubular conduit 24. When the operating mechanism of the machine is started, the sound waves, passing from the hollow supporting arm 20 into the horn or megaphone 24, will be directed by the latter to the inner face of the curved rear end of the cover 11. This surface will act as a deflecting surface, and direct the sound waves either toward the open end of the cover or toward the front end 11' thereof, which latter will also act as a deflecting surface. Of course, it will depend upon the angle of incidence of the sound waves issuing from the horn or megaphone 24 whether said waves will be deflected once or twice. It should be observed that the horn or megaphone 24, which is entirely inclosed within the casing 10, acts as a sound conveying and amplifying means, and the

cover 11 as a deflecting and additional, amplifying sound board; or in other words the megaphone 24 gives an amplifying effect which takes the place of the ordinary horn type of amplifier, and the cover 11 being curved and of the proper form, receives the sound waves and deflects the same outward, serving at the same time as a sound board or additional sound amplifying means.

What I claim is:—

1. A sound amplifier for phonographs or the like embodying a cover hinged to a main casing and having a portion thereof adapted to project inwardly into said casing when the cover is opened, a conduit arranged in the casing and opening toward the inwardly projecting portion of the cover, and a sound reproducer connected to the opposite end of said conduit.

2. In combination with a casing for a sound reproducing mechanism, a cover therefor hinged intermediate its ends, said cover having a portion adapted to project into the casing when the cover is in open position, a conduit extending through the casing and opening toward the inwardly projecting portion of the cover and a reproducer arm connecting with said conduit.

3. In combination with a sound reproducing mechanism, a casing comprising a main casing and a cover, said cover adapted when open to extend downwardly within said casing and project above said casing, a sound conveying conduit arranged in said casing and opening toward the downwardly projecting end of the cover, and a reproducer mechanism connecting with said conduit.

4. In combination with a sound producing mechanism having a casing, and a sound-conveying conduit with a compartment connecting with said conduit, a cover hinged above said compartment and adapted to be swung as to its lower end into said compartment connecting with the conduit and a reproducer mechanism connecting with said conduit.

5. In a phonograph, the combination with a casing for a sound reproducing mechanism provided with an opening in its top portion, of a hollow reproducer supporting arm mounted thereon, a sound conducting channel communicating with said supporting arm and running through said casing toward the opening in the top of the same, and a cover adapted to project into said casing and operate as a deflector for the sound waves issuing from said sound conducting channel.

6. In a phonograph, the combination with a casing for a sound reproducing mechanism provided with an opening in its top portion, of a hollow reproducer supporting arm mounted thereon, a horn communicat-

ing with said supporting arm and running  
through said casing toward the opening in  
the top of the same, and a cover adapted to  
project into said casing and operate as a  
5 deflector for the sound waves issuing from  
said horn.

Signed at New York, in the county of

New York and State of New York, this 10th  
day of October, 1911.

VITO ETTORE D'URSO

Witnesses:

PASQUALE TRIPPUTI,  
SIGMUND HERZOG.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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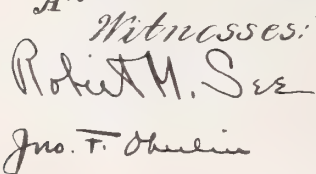


PHONOGRAPH.

1,020,151.

Patented Mar. 12, 1912.

2 SHEETS—SHEET 1.



Inventor:  
Harry B. McNulty  
by J. B. Fay  
Attorney.



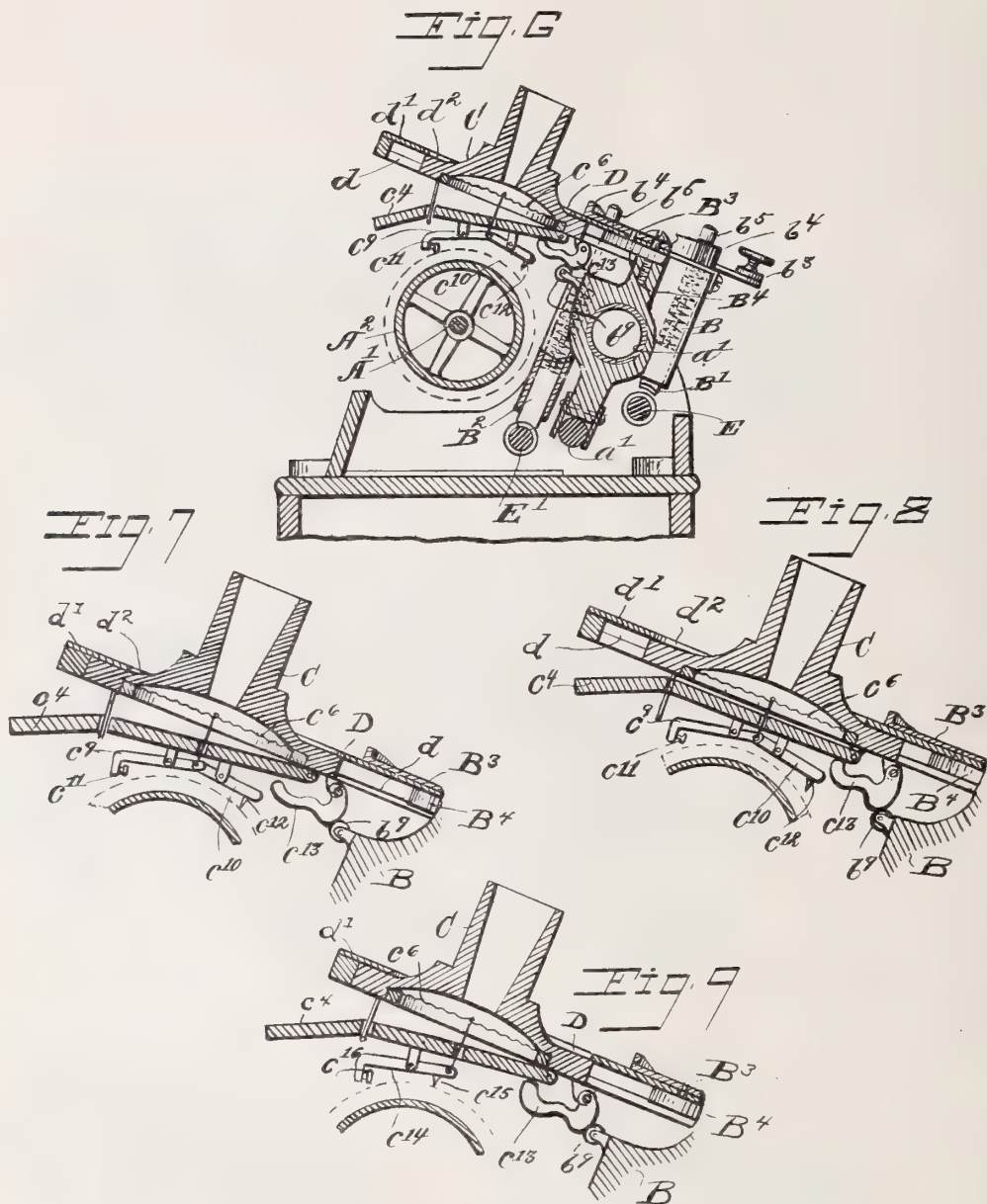


H. B. McNULTY.  
 PHONOGRAPH.  
 APPLICATION FILED MAY 24, 1909.

1,020,151.

Patented Mar. 12, 1912.

2 SHEETS—SHEET 2.



Witnesses:  
 Robert M. See  
 Jno. T. Obelin

Inventor:  
 Harry B. McNulty  
 by J. B. Fay  
 Attorney

# UNITED STATES PATENT OFFICE.

HARRY B. McNULTY, OF EAST CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNITED STATES PHONOGRAPH COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

PHONOGRAPH.

1,020,151.

Specification of Letters Patent.

Patented Mar. 12, 1912.

Application filed May 24, 1909. Serial No. 498,040.

*To all whom it may concern:*

Be it known that I, HARRY B. McNULTY, a citizen of the United States, and a resident of East Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Phonographs, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The object of the invention is the provision of a phonograph that will be adapted to operate, as desired upon records having threads of different fineness, as for instance, upon records having 100 and 200 threads to the inch, or as they are commonly known "two minute" and "four minute" records. Such adaptation involves a change in the rate of the movement of the sound-box along the record to correspond with such thread-fineness, and a corresponding shifting of the stylus, since a stylus suitable for playing or cutting one thread, as for example, the finer thread, will not work satisfactorily in the case of the coarser thread, and vice versa. The present invention is designed to supply simple and conveniently operable means for correlating and simultaneously effecting these two adjustments, said means together with other accessory features being hereinafter fully described and particularly pointed out in the claims. The annexed drawings and the following description set forth in detail, certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:—Figure 1 is a front elevation of a phonograph embodying my several improvements; Fig. 2 is a transverse sectional view thereof with parts appearing in elevation; Fig. 3 is a similar transverse sectional view of a part only of the device, the sound-box and adjacent parts alone appearing and being shown in a different operative position from that of Fig. 2; Fig. 4 is a view similar to Fig. 3, but showing the parts in question in yet another operative position; Fig. 5 is a plan view of the sound-box carriage with parts broken away to show certain operating details; Fig.

6 is a transverse sectional view of a phonograph corresponding to that of Fig. 2, but showing certain modifications in construction; Figs. 7 and 8 are similar sectional views, showing the sound-box and adjacent parts only, such latter appearing in different operative positions from that of Fig. 6; and Fig. 9 illustrates, by a corresponding section, the adaptation of my invention to a slightly different type of sound-box.

Referring first of all to Figs. 1 and 2, A will be seen to indicate the base of the phonograph, it not being intended to designate the driving mechanism, whether a spring or other motor, as a part of the phonograph. The main shaft A' of the phonograph, accordingly, upon which record-receiving mandrel A<sup>2</sup> is mounted, is provided with a driving pulley a, by means of which connection between such motor, whatever its character, and the phonograph, may be had. It will be understood that the motor is suitably governed to drive such main shaft at a predetermined rate of speed. Parallel with shaft A' and mandrel A<sup>2</sup>, are ways a' upon which is slidably mounted the carriage B that furnishes support for the sound-box C, which in illustrated form is designed for sound-reproduction purposes and so will hereinafter be referred to simply as a reproducer. Such sound-box, or reproducer, it will be understood requires to be fed along the record mounted upon the mandrel when the machine is in use.

The feeding mechanism for the carriage comprises two feed screws E, E' respectively having a thread corresponding with two desired rates of feed, when taken in conjunction with the gearing connection (not shown) that is provided for driving said screws from the main or mandrel shaft A' of the phonograph. As illustrated, such thread is designed to be the same on both screws, and the entire variation in rate is secured by rotating the one screw twice as rapidly as the other by suitably proportioning the connecting gears, just referred to, with this result in view. Reciprocally mounted in the carriage B are two plungers B' B<sup>2</sup>, the lower ends of which are in the form of sectional nuts adapted to cooperate with such feed screws, respectively, springs b' b<sup>2</sup> being provided in connection with such plungers to normally retain the same in en-



gement with the corresponding feed screws. Rotatably mounted upon the upper face of the carriage, is a disk B<sup>3</sup> provided with an operating handle b<sup>3</sup> and bearing on its upper face a cam b<sup>4</sup> adapted to engage the upper ends b<sup>5</sup> b<sup>6</sup> of the plungers B<sup>7</sup> B<sup>2</sup> respectively, and so disposed as to withdraw the same from engagement with the screws E E' in the intermediate position of the handle as illustrated in Fig. 2. However, first the one and then the other of said plungers is allowed to be lowered by its spring into such engagement, upon turning the aforesaid handle to the right or left of such intermediate position, as will be obvious. That portion of the carriage designed for the reception of the reproducer, instead of consisting of an annular holder in which the reproducer is designed to be snugly held, as in the prevailing construction, comprises an elongated way D, said way being disposed transversely of the mandrel upon which the record is mounted. The details of the construction of this way need not be further noted, than to remark that it comprises in effect two lateral guides d adapted to be covered, in the assembled machine, by a plate d' in which an elongated slot d<sup>2</sup> is provided through which the upper tubular part of the reproducer extends.

The flanged part or base c of the reproducer is modified in form to fit the guides d, and in addition is provided with forwardly projecting arms c' c<sup>2</sup> that lie on either side of the axis of the cam disk B<sup>3</sup>. Suitably held in the carriage frame, and secured to said cam disk, so as to be in effect a part of the same, is a broken gear B<sup>4</sup> the teeth of which mesh with a series of rack-teeth c<sup>3</sup> on the reproducer arm c'. Rotation of said cam plate will accordingly be effective, when said gear and rack are in engagement, to shift the reproducer transversely of the mandrel A<sup>2</sup> and of a record mounted thereon. The second reproducer arm c<sup>2</sup> merely bears against the smooth side of the gear B<sup>4</sup>, so as to steady this movement and prevent the reproducer from binding in the guide ways that slidably support the same. I further provide on the under face of such gear member, a raised edge b<sup>7</sup> constituting a cam which engages with the rear end of a lever b<sup>8</sup>, so as to rock the same, as said gear member B<sup>3</sup> is rotated. The conformation of such cam b<sup>7</sup> is such as to oscillate the lever to immediately raise the floating weight c<sup>4</sup> of the reproducer C upon actuation of the gear member from either of its extreme positions, (in which connection is had with one or the other of the feed screws), and before any operative engagement takes place between the gear and rack teeth. Engagement between these last named parts, however, does take place at an intermediate position of the gear member, but ceases before

cam b<sup>7</sup> permits the weight of the reproducer to be again lowered into operative position. It will thus be seen that the floating weight c<sup>4</sup> and thereby the stylus lever c<sup>5</sup> of the reproducer are raised into inoperative position whenever the reproducer is shifted. This stylus lever, while attached to the weight c<sup>4</sup> and connected with the diaphragm c<sup>6</sup> of the reproducer in the prevailing fashion, is distinguished from such prevailing construction by bearing two styluses c<sup>7</sup> c<sup>8</sup> instead of one. Of these styluses, the one is adapted, in the manner previously indicated, for operation on records having one fineness of thread, while the other is similarly adapted for operation of another type of record. Said styluses furthermore, are so disposed on the lever that the shifting movement just referred to as being secured by rotation of the cam plate B<sup>3</sup> and attached gear member B<sup>4</sup> brings first the one and then the other stylus into contact with the record mounted upon the phonograph mandrel. Accordingly a single operation of the handle b<sup>3</sup> it will be seen, serves to control connection of the carriage with the feed screws, and simultaneously to prepare the reproducer for operation on a record corresponding with the particular feed screw that may be operatively connected with the carriage.

The modification in construction illustrated in Figs. 6, 7 and 8 consists first of all in the use of two stylus levers c<sup>9</sup> c<sup>10</sup> extending in opposite radial directions from the center of the reproducer, but each connected with the floating weight c<sup>4</sup> and otherwise figuring as the single stylus lever of the prevailing type of phonograph. The styluses c<sup>11</sup> c<sup>12</sup> of said levers, however, are respectively formed for use in connection with different types of records as in the case of the two styluses c<sup>7</sup> c<sup>8</sup> borne by the single lever c<sup>5</sup> in the first described construction. A further change introduced in this construction, is the substitution for the lever b<sup>8</sup> operated by the raised cam edge b<sup>7</sup> of gear member B<sup>4</sup>, of a dog c<sup>13</sup> borne by the under side of the plate c forming the slidably base of the reproducer, which dog is brought into engagement with a roller b<sup>9</sup> as said reproducer is now advanced, now retracted. Since roller b<sup>9</sup> is mounted on a fixed axis the effect of this engagement, as will be evident from an inspection of the figures of reference, will be substantially the same as that of the lever previously described; namely, the floating weight of the reproducer will be raised immediately upon movement of the reproducer from either of its extreme positions, and such weight will be held in raised position until the other normal operative position is reached. The general operation of the device aside from this, however, remains the same, the control of the rate of feed being obviously correlated, as before, with the ad-

justment of the reproducer to play on one kind of record or the other, as occasion may demand.

In Fig. 9 I have shown yet another construction of stylus lever, whereby two styluses  $c^{14}$   $c^{15}$ , respectively adapted for operation on diverse kinds of records as heretofore described, are supported from one stylus lever  $c^{16}$  in such position that shifting of the reproducer transversely of the record will bring first one and then the other of such styluses into operation with the latter. No detail description of the operation of this modification is deemed necessary, as this fully appears from an inspection of the figure.

Obviously, the various modifications in construction illustrated in the several figures of the drawings may be variously combined, as there is no necessary insistence on the particular association of such constructional forms that happens to be shown in any one of such figures.

It is not intended, moreover, by referring to the specific use of the improvements under consideration in adapting a phonograph to operation on records of the specific kind described, to imply any limitation to the use of the invention to the accomplishment of this object, since various features embodied herein are susceptible of more general application.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any one of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention: -

1. In mechanism of the class described, the combination of a record support; a movably mounted sound-box provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; means adapted variously to feed said record support and sound-box relatively to each other; and controlling means for said feed means adapted likewise to shift said reproducer to operatively position the desired stylus.

2. In mechanism of the class described, the combination of a record support; a slideway; a sound-box mounted on said slideway and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; means adapted to feed said record-support and slideway relatively to each other at different rates of speed; and controlling means for said feed means adapted likewise to shift said sound-box in said slide-way to operatively position the desired stylus.

3. In mechanism of the class described, the combination of a mandrel for the record and a member relatively movable in a direction longitudinal of said mandrel, said member including a slideway extending transversely of said mandrel; a sound-box mounted on said slideway and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; means adapted to feed said mandrel and member relatively to each other at different rates of speed; and controlling means for said feed means adapted likewise to shift said sound-box in said slideway.

4. In mechanism of the class described, the combination of a record support; a sound-box movably mounted and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; means adapted to variously feed said record support and sound-box relatively to each other; and controlling means for said feed means adapted likewise to raise said styluses from a record and shift said sound-box.

5. In mechanism of the class described, the combination of a record support; a slideway; a sound-box mounted on said slideway and including a weight and a plurality of styluses borne by said weight, said styluses being respectively adapted to operate upon a record in different positions of said sound-box; means adapted to feed said record support and slideway relatively to each other at different rates of speed; and controlling means for said feed means adapted likewise to raise said weight to render said styluses inoperative and to thereupon shift said sound-box in said slideway.

6. In mechanism of the class described, the combination of a mandrel for the record and a member relatively movable in a direction longitudinal of said mandrel, said member including a slideway extending transversely of said mandrel; a sound-box mounted on said slideway and including a weight and a plurality of styluses borne by said weight, said styluses being respectively adapted to operate upon a record in different positions of said sound-box; means adapted to feed said mandrel and member relatively to each other at different rates of speed; and controlling means for said feed means adapted likewise to raise said weight to render said styluses inoperative and to thereupon shift said sound-box in said slide-way.

7. In a phonograph, the combination of a rotary record-carrying mandrel and a member relatively movable in a direction longitudinal of said mandrel, said member including a slideway extending transversely of said mandrel; a sound-box mounted on said slideway and provided with a plurality



of styluses respectively adapted to operate upon records with threads of different fineness; means adapted to rotate said mandrel, and to feed said mandrel and sound-box relatively to each other; and means adapted to change the rate of such feed movement relatively to the rate of rotation of said mandrel and likewise shift said sound-box to operatively position the corresponding stylus.

8. In a phonograph, the combination of a rotary record-carrying mandrel and a member relatively movable in a direction longitudinal of said mandrel, said member including a slideway extending transversely of said mandrel; a sound-box mounted on said slideway and including a weight and a plurality of styluses borne by said weight, said styluses being respectively adapted to operate upon records with threads of different fineness; means adapted to feed said mandrel and member relatively to each other; and means adapted to change the rate of such feed movement relatively to the rate of rotation of said mandrel, and likewise to raise said weight to render said styluses inoperative and thereupon shift said sound-box in said slideway to operatively position the corresponding stylus.

9. In a phonograph, the combination of a sound-box movably mounted and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; means adapted to variously feed said sound-box; and controlling means for said feed means likewise adapted to shift said sound-box.

10. In a phonograph, the combination of a carriage including a slideway, a sound-box mounted on said slideway and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; means adapted to feed said carriage at different rates of speed; and controlling means for said feed means likewise adapted to shift said sound-box in said slideway.

11. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage including a slideway extending transversely of said mandrel; a sound-box mounted on said slideway and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; means adapted to feed said carriage at different rates of speed; and controlling means for said feed means likewise adapted to shift said sound-box in said slideway.

12. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage including a slideway extending transversely of said mandrel; a sound-

box mounted on said slideway and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; feed screws adapted to move said carriage at different rates of speed, respectively; and means for operatively connecting said carriage with either of said feed screws as desired, said means being likewise effective to shift said sound-box in said slideway.

13. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of such mandrel, said carriage including a slideway extending transversely of said mandrel; a sound-box mounted on said slideway and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; two feed screws alined with the path of travel of said carriage and adapted to move the same at different rates of speed, respectively; movable members in said carriage adapted to connect the same with either of said screws as desired; and actuating means for said connecting members, said means being also connected with said sound-box to shift the same in said slideway, substantially as described.

14. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage including a slideway extending transversely of said mandrel; a sound-box mounted on said slideway and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; two feed screws alined with the path of travel of said carriage and adapted to move the same at different rates of speed, respectively; reciprocable members in said carriage adapted to connect the same with either of said screws as desired; and a cam-plate adapted thus alternately to actuate the same, said cam-plate being also connected with said sound-box so as to shift the same in said slideway, substantially as described.

15. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage including a slideway extending transversely of said mandrel; a sound-box mounted on said slideway and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; two feed screws alined with the path of travel of said carriage and adapted to move the same at different rates of speed, respectively; spring-pressed plungers in said carriage normally tending to connect the same with said screws; and a rotatable cam-plate adapted in one position to retain both said plungers inoperative, but to permit their operation,

respectively, upon movement in one direction or the other from such position, said cam-plate being connected with said sound-box to shift the same in said slideway. substantially as described.

16. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage including a slideway extending transversely of said mandrel; a sound-box mounted on said slideway and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; two feed screws alined with the path of travel of said carriage and adapted to move the same at different rates of speed, respectively; spring-pressed plungers in said carriage normally tending to connect the same with said screws; and a rotatable cam-plate adapted in one position to retain both said plungers inoperative, but to permit their operation, respectively, upon movement in one direction or the other from such position. said cam-plate having rack-and-pinion engagement with said sound-box, whereby rotation of said cam-plate also serves to position said reproducer in said slideway.

17. In a phonograph, the combination of a sound-box movably mounted and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said sound-box; means adapted to variously feed said sound-box; and controlling means for said feed means likewise adapted to raise said styluses from the record and shift said sound-box, substantially as described.

18. In a phonograph, the combination of a carriage provided with a slideway, a sound-box mounted on said slideway and including a weight and a plurality of styluses borne by said weight, said styluses being respectively adapted to operate upon a record in different positions of said sound-box; means adapted to feed said carriage at different rates of speed; and controlling means for said feed means likewise adapted to raise said weight to render said styluses inoperative and to thereupon shift said sound-box in said slideway.

19. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage being provided with a slideway extending transversely of said mandrel; a sound-box mounted on said slideway and including a weight and a plurality of styluses borne by said weight, said styluses being respectively adapted to operate upon a record in different positions of said sound-box; means adapted to feed said carriage at different rates of speed; and controlling means for said feed means likewise adapted to raise said weight to render said styluses

inoperative and to thereupon shift said sound-box in said slideway.

20. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage being provided with a slideway extending transversely of said mandrel; a sound-box mounted on said slideway and including a weight and a plurality of styluses borne by said weight, said styluses being respectively adapted to operate upon a record in different positions of said sound-box; two feed screws alined with the path of travel of said carriage and adapted to move the same at different rates of speed, respectively; movable members in said carriage adapted to connect the same with either of said screws as desired; a rotatable cam-plate adapted to control connection of said members with said screws; said cam-plate having rack-and-pinion engagement with said sound-box, whereby rotation of said cam-plate also serves to position said sound-box in said slideway; and a lever mounted in said carriage and adapted to raise said weight, said cam-plate being connected to operate said lever incidentally to rotation thereof.

21. In a phonograph, the combination of a reproducer movably mounted and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said reproducer, said styluses being furthermore formed for playing upon threads of different fineness, respectively; means adapted to variously feed said reproducer; and controlling means for said feed means likewise adapted to shift said reproducer.

22. In a phonograph, the combination of a carriage including a slideway, a reproducer mounted on said slideway and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said reproducer, said styluses being furthermore formed for playing upon threads of different fineness, respectively; means adapted to feed said carriage at different rates of speed; and controlling means for said feed means likewise adapted to shift said reproducer in said slideway.

23. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage including a slideway extending transversely of said mandrel; a reproducer mounted on said slideway and provided with a plurality of styluses respectively adapted to operate upon a record in different positions of said reproducer, said styluses being furthermore formed for playing upon threads of different fineness, respectively; means adapted to feed said carriage at different rates of speed; and con-



trolling means for said feed means likewise adapted to shift said reproducer in said slideway.

24. In a phonograph, the combination of  
 5 a mandrel for the record and a carriage  
 movable longitudinally of said mandrel,  
 said carriage including a slideway extend-  
 ing transversely of said mandrel; a repro-  
 10 ducer mounted on said slideway and pro-  
 vided with a plurality of styluses respec-  
 tively adapted to operate upon a record in  
 different positions of said reproducer, said  
 styluses being furthermore formed for play-  
 15 ing upon threads of different fineness, respec-  
 tively; feed screws adapted to move said  
 carriage at different rates of speed, respec-  
 tively; and means for operatively connect-  
 ing said carriage with either of said feed  
 20 screws as desired, said means being likewise  
 effective to shift said reproducer in said  
 slideway.

25. In a phonograph, the combination of  
 a mandrel for the record and a carriage  
 movable longitudinally of such mandrel,  
 25 said carriage including a slideway extend-  
 ing transversely of said mandrel; a repro-  
 ducer mounted on said slideway and pro-  
 vided with a plurality of styluses respec-  
 tively adapted to operate upon a record in  
 30 different positions of said reproducer, said  
 styluses being furthermore formed for play-  
 ing upon threads of different fineness, respec-  
 tively; two feed screws alined with the  
 path of travel of said carriage and adapted  
 35 to move the same at different rates of speed,  
 respectively; movable members in said car-  
 riage adapted to connect the same with  
 either of said screws as desired; and actu-  
 ating means for said connecting members,  
 40 said means being also connected with said  
 reproducer to shift the same in said slide-  
 way, substantially as described.

26. In a phonograph, the combination of  
 a mandrel for the record and a carriage  
 45 movable longitudinally of said mandrel,  
 said carriage including a slideway extend-  
 ing transversely of said mandrel; a repro-  
 ducer mounted on said slideway and pro-  
 vided with a plurality of styluses respec-  
 50 tively adapted to operate upon a record in  
 different positions of said reproducer, said  
 styluses being furthermore formed for play-  
 ing upon threads of different fineness, respec-  
 tively; two feed screws alined with the  
 55 path of travel of said carriage and adapted  
 to move the same at different rates of speed,  
 respectively; reciprocable members in said  
 carriage adapted to connect the same with  
 either of said screws as desired; and a cam-  
 60 plate adapted thus alternately to actuate  
 the same, said cam-plate being also con-  
 nected with said reproducer so as to shift  
 the same in said slideway, substantially as  
 described.

27. In a phonograph, the combination of

a mandrel for the record and a carriage  
 movable longitudinally of said mandrel,  
 said carriage including a slideway extend-  
 ing transversely of said mandrel; a repro-  
 70 ducer mounted on said slideway and pro-  
 vided with a plurality of styluses respec-  
 tively adapted to operate upon a record in  
 different positions of said reproducer, said  
 styluses being furthermore formed for play-  
 ing upon threads of different fineness, respec-  
 75 tively; two feed screws alined with the  
 path of travel of said carriage and adapted  
 to move the same at different rates of speed,  
 respectively; spring-pressed plungers in said  
 carriage normally tending to connect the  
 80 same with said screws; and a rotatable cam-  
 plate adapted in one position to retain both  
 said plungers inoperative, but to permit  
 their operation, respectively, upon move-  
 ment in one direction or the other from such  
 85 position, said cam-plate being connected  
 with said reproducer to shift the same in  
 said slideway, substantially as described.

28. In a phonograph, the combination of  
 a mandrel for the record and a carriage  
 90 movable longitudinally of said mandrel,  
 said carriage including a slideway extend-  
 ing transversely of said mandrel; a repro-  
 ducer mounted on said slideway and pro-  
 vided with a plurality of styluses respec-  
 95 tively adapted to operate upon a record in  
 different positions of said reproducer, said  
 styluses being furthermore formed for play-  
 ing upon threads of different fineness, respec-  
 tively; two feed screws alined with the  
 100 path of travel of said carriage and adapted  
 to move the same at different rates of speed,  
 respectively; spring-pressed plungers in said  
 carriage normally tending to connect the  
 same with said screws; and a rotatable cam-  
 105 plate adapted in one position to retain both  
 said plungers inoperative, but to permit  
 their operation, respectively, upon move-  
 ment in one direction or the other from such  
 position, said cam-plate having rack-and-  
 110 pinion engagement with said reproducer,  
 whereby rotation of said cam-plate also  
 serves to position said reproducer in said  
 slideway.

29. In a phonograph, the combination of  
 a reproducer movably mounted and pro-  
 vided with a plurality of styluses respec-  
 tively adapted to operate upon a record in  
 different positions of said reproducer, said  
 120 styluses being furthermore formed for play-  
 ing upon threads of different fineness, respec-  
 tively; means adapted to variously feed  
 said reproducer; and controlling means for  
 said feed means likewise adapted to raise  
 said styluses from the record and shift said  
 125 reproducer, substantially as described.

30. In a phonograph, the combination of  
 a carriage provided with a slideway, a re-  
 producer mounted on said slideway and in-  
 130 cluding a floating weight and a plurality of

styluses borne by said weight, said styluses being respectively adapted to operate upon a record in different positions of said reproducer, said styluses being furthermore  
 5 formed for playing upon threads of different fineness, respectively; means adapted to feed said carriage at different rates of speed; and controlling means for said feed means likewise adapted to raise said weight to render  
 10 said styluses inoperative and to thereupon shift said reproducer in said slideway.

31. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel,  
 15 said carriage being provided with a slideway extending transversely of said mandrel; a reproducer mounted on said slideway and including a floating weight and a plurality of styluses borne by said weight, said  
 20 styluses being respectively adapted to operate upon a record in different positions of said reproducer, said styluses being furthermore formed for playing upon threads of different fineness, respectively; means adapted  
 25 to feed said carriage at different rates of speed; and controlling means for said feed means likewise adapted to raise said weight to render said styluses inoperative and to thereupon shift said reproducer in said  
 30 slideway.

32. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage being provided with a slideway extending transversely of said mandrel; a reproducer mounted on said slideway and including a floating weight and a plurality of styluses borne by said weight, said styluses being respectively adapted to operate upon a record in different positions of said reproducer, said styluses being furthermore formed for playing upon threads of different fineness, respectively; two feed screws alined with the path of travel of said carriage and adapted to move the same at different rates of speed, respectively; movable members in said carriage adapted to connect the same with either of said screws as desired; a rotatable cam-plate  
 45 adapted to control connection of said members with said screws, said cam-plate having rack-and-pinion engagement with said reproducer, whereby rotation of said cam-plate also serves to position said reproducer in said slideway; and a lever mounted in said carriage and adapted to raise said weight, said cam-plate being connected to operate said lever incidentally to rotation thereof.

33. In mechanism of the class described, the combination of a record support; a movably mounted sound-box provided with a stylus lever; a plurality of styluses borne by said lever and respectively adapted to operate upon a record in different positions of

said sound-box; means adapted variously to feed said record support and sound-box relatively to each other; and controlling means for said feed means adapted likewise to shift said sound-box to operatively position the  
 70 desired stylus.

34. In mechanism of the class described, the combination of a record support; a movably mounted sound-box provided with a floating weight and a stylus lever attached to said weight; a plurality of styluses borne by said lever and respectively adapted to operate upon a record in different positions of said sound-box; means adapted variously to feed said record support and sound-box  
 75 relatively to each other; and adapted likewise to raise said weight to lift said lever and styluses and thereupon shift said sound-box to operatively position the desired stylus.

35. In a phonograph, the combination of a reproducer movably mounted and provided with a stylus lever; a plurality of styluses borne by said lever and respectively adapted to operate upon a record in different positions of said reproducer; means adapted to variously feed said reproducer; and controlling means for said feed means likewise adapted to shift said reproducer.

36. In a phonograph, the combination of a carriage including a slideway, a reproducer mounted on said slideway and provided with a stylus lever; and a plurality of styluses borne by said lever and respectively adapted to operate upon a record in different positions of said reproducer; means adapted to feed said carriage at different rates of speed; and controlling means for said feed means likewise adapted to shift said reproducer in said slideway.

37. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage including a slideway extending transversely of said mandrel; a reproducer mounted on said slideway and provided with a stylus lever; a plurality of styluses borne by said lever and respectively adapted to operate upon a record in different positions of said reproducer; means adapted to feed said carriage at different rates of speed; and controlling means for said feed means likewise adapted to shift said reproducer in said slideway.

38. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage including a slideway extending transversely of said mandrel; a reproducer mounted on said slideway and provided with a stylus lever; a plurality of styluses borne by said lever and respectively adapted to operate upon a record in different positions of said reproducer; feed screws adapted to move said carriage at different



rates of speed, respectively; and means for operatively connecting said carriage with either of said feed screws as desired, said means being likewise effective to shift said  
5 reproducer in said slideway.

39. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage including a slideway extending  
10 transversely of said mandrel; a reproducer mounted on said slideway and provided with a similarly extending stylus lever; a plurality of styluses borne by said lever and respectively adapted to operate upon a record  
15 in different positions of said reproducer; two feed screws alined with the path of travel of said carriage and adapted to move the same at different rates of speed, respectively; movable members in said carriage  
20 adapted to connect the same with either of said screws as desired; and actuating means for said connecting members, said means being also connected with said reproducer to shift the same in said slideway, substantially  
25 as described.

40. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage including a slideway extending  
30 transversely of said mandrel; a reproducer mounted on said slideway and provided with a similarly extending stylus lever; a plurality of styluses borne by said lever and respectively adapted to operate upon a record  
35 in different positions of said reproducer; two feed screws alined with the path of travel of said carriage and adapted to move the same at different rates of speed, respectively; reciprocable members in said carriage  
40 adapted to connect the same with either of said screws as desired; and a cam-plate adapted thus alternately to actuate the same, said cam-plate being also connected with said reproducer so as to shift the same in  
45 said slideway, substantially as described.

41. In a phonograph, the combination of a movably mounted reproducer provided with a stylus lever; a plurality of styluses borne by said lever and respectively adapted  
50 to operate upon a record in different positions of said reproducer; means adapted to variously feed said reproducer; and controlling means for said feed means likewise adapted to raise said styluses from the record and shift said reproducer, substantially  
55 as described.

42. In a phonograph, the combination of a carriage provided with a slideway; a reproducer mounted on said slideway and including a floating weight and a stylus lever  
60 attached to said weight; a plurality of styluses borne by said lever, said styluses being respectively adapted to operate upon a record in different positions of said reproducer; means adapted to feed said carriage at different rates of speed; and controlling means for said feed means likewise adapted to raise said weight to render said styluses inoperative and to thereupon shift said reproducer in said slideway.

43. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage being provided with a slideway extending transversely of said mandrel; a reproducer mounted on said slideway and including a floating weight and a stylus lever likewise extending transversely of said mandrel; a plurality of styluses borne by said lever, said styluses being respectively adapted to operate upon a record in different positions of said reproducer; means adapted to feed said carriage at different rates of speed; and controlling means for said feed means likewise adapted to raise  
70 said weight to render said styluses inoperative and to thereupon shift said reproducer in said slideway.

44. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage being provided with a slideway extending transversely of said mandrel; a reproducer mounted on said slideway and including a floating weight and a stylus lever attached to said weight; a plurality of styluses borne by said lever, said styluses being respectively adapted to operate upon a record in different positions of said reproducer; means adapted to feed said carriage at different rates of speed; and controlling means for said feed means likewise adapted to raise  
85 said weight to render said styluses inoperative and to thereupon shift said reproducer in said slideway.

45. In a phonograph, the combination of a mandrel for the record and a carriage movable longitudinally of said mandrel, said carriage being provided with a slideway extending transversely of said mandrel; a reproducer mounted on said slideway and including a floating weight and a stylus lever attached to said weight; a plurality of styluses borne by said lever, said styluses being respectively adapted to operate upon a record in different positions of said reproducer; two feed screws alined with the path of travel of said carriage and adapted to move the same at different rates of speed, respectively; movable members in said carriage adapted to connect the same with either of said screws as desired; a rotatable cam-plate adapted to control connection of said members with said screws, said cam-plate having rack-and-pinion engagement with said reproducer, whereby rotation of said cam-plate also serves to position said  
100 reproducer in said slide-way; and a lever mounted in said carriage and adapted to raise said weight, said cam-plate being connected to operate said lever incidentally to rotation thereof.

Signed by me this 17th day of May, 1909.  
HARRY B. McNULTY.

Attested by—

ANNA L. GILL,  
JNO F. OBELIN.



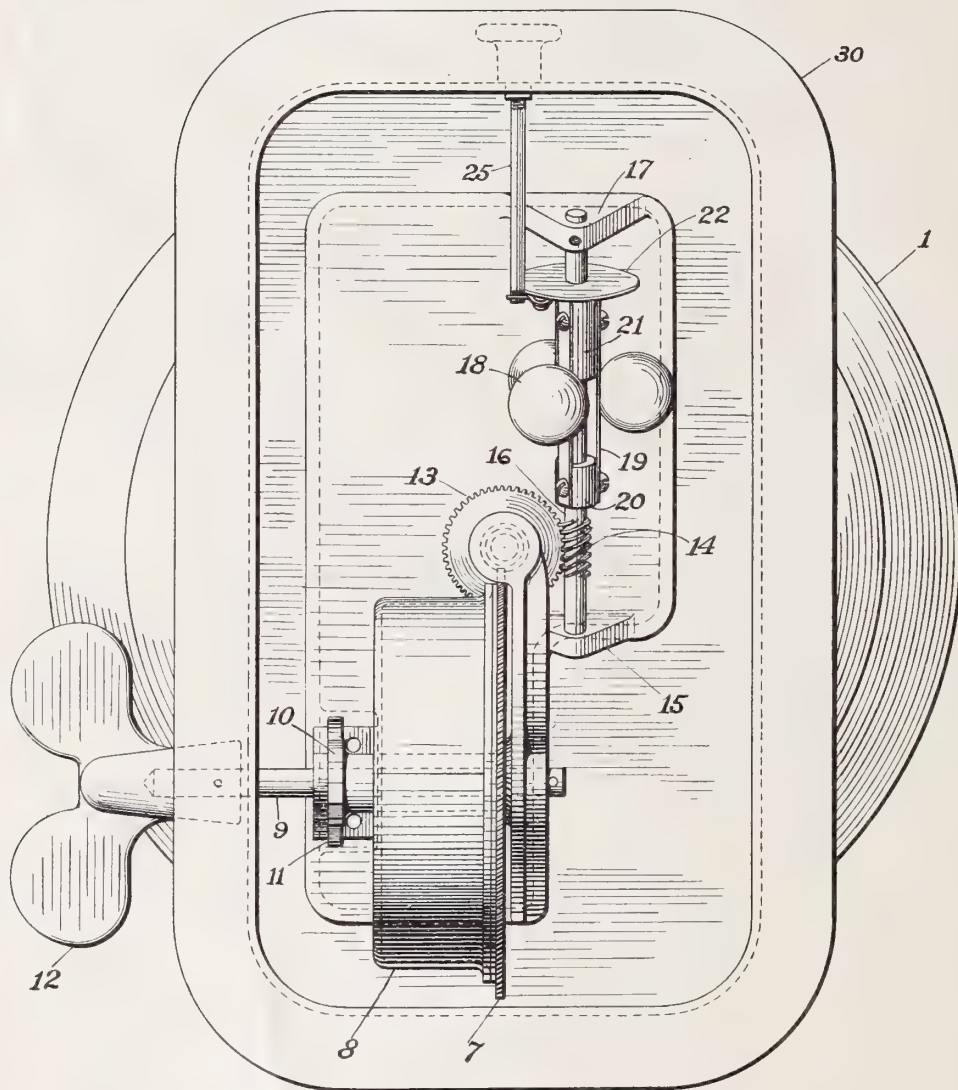
E. R. JOHNSON.  
MOTOR FOR TALKING MACHINES.  
APPLICATION FILED NOV. 12, 1904.

1,020,206.

Patented Mar. 12, 1912.

2 SHEETS—SHEET 1.

*Fig. 1.*



WITNESSES:

*Robt. R. Mitchell*  
*Edw. W. Vaill Jr.*

INVENTOR

*Eldridge R. Johnson*

BY

*Wm. C. Little*  
ATTORNEY.





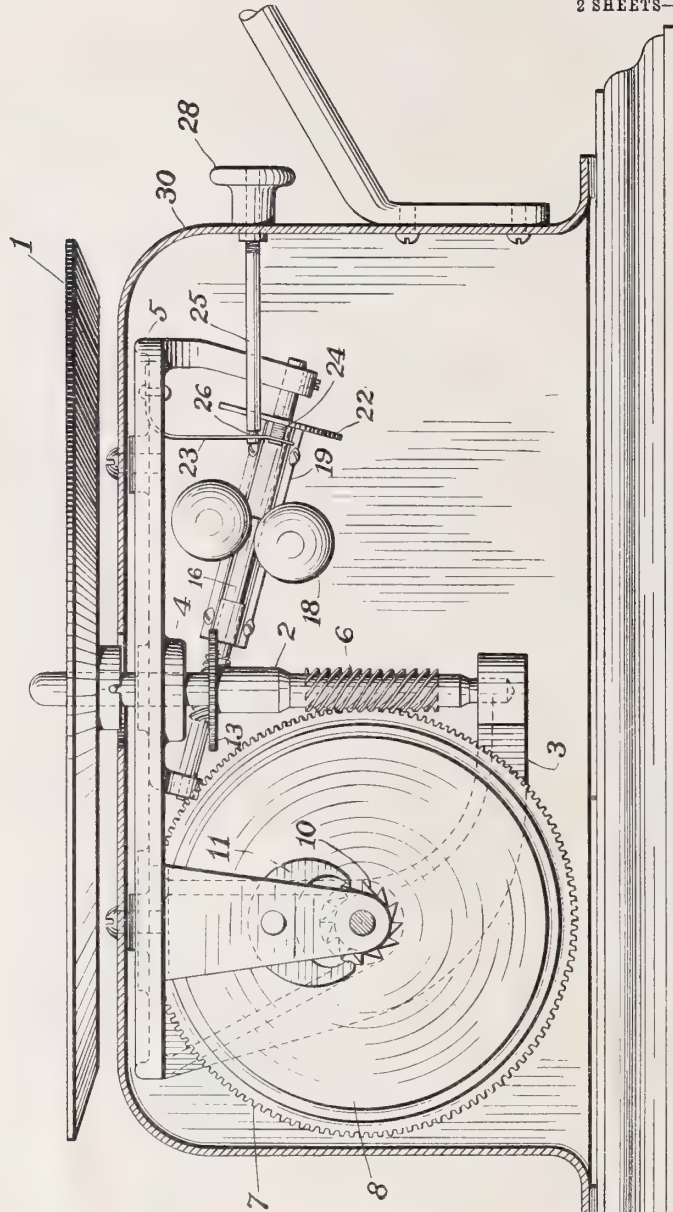
E. R. JOHNSON.  
MOTOR FOR TALKING MACHINES.  
APPLICATION FILED NOV. 12, 1904.

1,020,206.

Patented Mar. 12, 1912.

2 SHEETS—SHEET 2.

Fig. 2.



INVENTOR

WITNESSES:

Robt. A. Mitchell.

Edw. W. Vaill Jr.

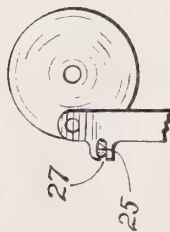


Fig. 3.

Eldridge R. Johnson  
By *Home Peltz*  
ATTORNEY.

# UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF MERION, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

## MOTOR FOR TALKING-MACHINES.

1,020,206.

Specification of Letters Patent.

Patented Mar. 12, 1912.

Application filed November 12, 1904. Serial No. 232,390.

*To all whom it may concern:*

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of Merion, county of Montgomery, State of Pennsylvania, have invented certain new and useful Improvements in Motors for Talking-Machines, of which the following is a full, clear, and exact disclosure.

The object of my invention is to provide such a construction in the driving mechanism for talking machines that the natural vibrations incident to a train of spur gears in a talking machine motor will be practically overcome or reduced to a minimum and further to reduce the parts of said mechanism to the fewest possible number, and that it will be simple, and economical to manufacture, and will be most efficient for the purpose for which they are designed. Heretofore in the manufacture of motors for talking machines, it has usually been customary to connect the source of power, or springs, with the turntable by means of a train of spur gearing, often including bevel gears sometimes including in the train of gearing a worm and also to connect the centrifugal governor with the turntable shaft, or spindle, by means of auxiliary spur gears. It is well known that in the operation of a talking machine any vibrations of the parts of the motor, which are not caused by the reproducer, have undesirable effects upon the reproduction of the record. The vibrations are usually due to the meshing of teeth of the ordinary train of gears, and are of such frequency and strength, even in a carefully constructed motor as to be quite audible. Of course, such vibrations mingle with those produced from the record, and, therefore, impair the quality of the selection being reproduced. Even with the best of spur gears, after the same have been in operation for a period of time, the vibrations produced by the meshing of the gears is impossible to entirely overcome. Furthermore, in the use of a train of spur gears for talking machine motors, vibrations are also produced, which, although not audible to the ear as sound vibrations, yet may be of such a character as to cause the parts of the motor connected with the turntable to be vibrated, and so vibrate the turntable. In some instances this movement is not visible to the eye, and being independently inaudible such vibrations are not evident except in the impaired

quality of the reproduction, and it has been difficult for persons not familiar with the practical construction and operation of talking machines to determine just what causes the impaired reproduction of the records. Further in some instances, as where spur gears have become worn, the teeth of the driven gears may intermittently mesh and unmesh with the teeth of the driving gears with a jerky or uneven motion, which causes the turntable to revolve at an uneven speed, which, although the differences of speed are not visible, greatly impair the relative pitch of the successive notes or sounds reproduced from the record.

The object of my invention, therefore, as before stated, is to overcome these objections, which I accomplish by eliminating all intermeshing spur gears and communicating the power on an inclined plane or worm movement and at the same time so arranging the parts as to secure the desired speed in the turntable and governor by the use of the least number of parts.

For a full, clear, and exact description of my invention, reference may be had to the following specification and to the accompanying drawings forming a part thereof, in which—

Figure 1 is a bottom plan view of a talking machine motor embodying my improvements; Fig. 2 is an elevation of the same showing the casing for the motor in section, and Fig. 3 is a detail view showing the relation of the brake of the governor to the brake disk.

Referring to the drawings, the numeral 1 indicates the turntable, and 2 the vertical spindle, upon the upper end of which the turntable 1 is mounted; said turntable spindle 2 has a bearing in a suitable support 3 at its lower end, and passes through a journal or bearing 4 carried by the support plate, or standard, 5, of the motor. Adjacent the lower end of the turntable spindle, 2, I provide a spiral or worm 6, which is adapted to mesh with a worm wheel or gear 7, having inclined teeth to correspond with the inclination of the threads of the worm 6. The gear, 7, is preferably mounted upon, or carried by, the spring barrel or drum, 8, within which is mounted the usual spiral steel spring for furnishing the power to the motor. This spring barrel and spring are mounted upon a suitable shaft 9 which carries a ratchet wheel, 10, adapted to be en-



gaged by a rocking pawl, 11. The shaft, 9, is also adapted to be engaged by a winding key, 12, in any suitable, or well known manner.

5 Adjacent the upper end of the turntable spindle, 2, but below the bearing, 4, is fixed a spur gear 13 which is adapted to mesh with the worm, 14, carried by the shaft, or spindle, 16, of the centrifugal governor.  
 10 The governor spindle, 16, is mounted in a pair of supports or hangers 15, and 17, of different lengths, so that the axis of said spindle will be inclined as clearly indicated in Fig. 2. This inclination of the governor  
 15 spindle will cause the threads of the worm 14, to contact with the teeth of the spur gear at such points where the threads are practically at right angles to the plane of said spur gear. This arrangement will obviate  
 20 the necessity of making the surfaces of the teeth of the spur gear, 13, inclined to the plane of the gear, and it also tends to provide sufficient space for the governor balls, 18, to revolve in expanded circles as the  
 25 speed of the motor increases. It is also clear that if the gear, 7, on the drum 8, were so arranged, or journaled, relatively to the worm 6 as in the governor mechanism above described, a spur wheel might be used in-  
 30 stead of the worm gear 7. The governor balls, 18, are carried by strips of spring metal, 19, the ends of which are attached to a fixed sleeve 20, and also to a slidable sleeve 21, to which is attached the brake disk 22.  
 35 A spring strip 23, attached to the supporting plate, 5, of the motor, forms the support for the brake shoe, 24, and is adjustably fixed in position by means of a rod, 25, which has a grooved portion, 26, adapted to  
 40 be engaged by a notch, or slot, 27, in the brake shoe support, 23. The outer end of the rod, 25, is screw-threaded, and passes through a screw threaded opening in the thumb-nut, 28, said thumb nut, 28, being  
 45 revolvably fixed in an opening in the casing 30 of the motor. When it is desired to adjust the speed of the motor, the thumbnut, 28, may be turned in one direction, or the  
 50 other, thereby increasing or diminishing the pressure between the brake shoe, 24, and the brake disk 22. The operation of the other parts of my improved motor will be evident from an inspection of the drawing and the above description of the parts.  
 55 It will be seen that by providing the worms and gears as above described, there is no opportunity for the teeth of the gears to slip or knock or to create vibration, or to become worn so as to mesh and unmesh ir-  
 60 regularly, or inaccurately. The teeth of the spur gears come accurately into contact with the threads of the worms, and traverse such threads with a wedging or inclined plane

action, and since the threads of the worms are in continuous touch and contact with the 65 teeth of the driving gear, the rotation of the shafts upon which the worms are carried, will be smooth, continuous, and unvariable. In this manner the undesirable and harm-  
 70 ful vibrations, of other constructions referred to, are obviated or reduced to a minimum, and the running of the machine effected without interfering with the sound vibration reproduced from the sound record.

Having thus described my invention, it 75 will be obvious that changes may be made in form, arrangement, and proportion of parts, without departing from the spirit and scope of my invention, but

What I claim, and desire to protect by 80 Letters Patent, is:—

1. In a motor the combination with a driving shaft, means to drive the same, a spindle, a governor and a governor shaft, and gearing between said driving shaft and 85 said spindle and between said spindle and said governor shaft, all the gearing in said motor consisting of a gear wheel for the driving member of the gearing and a worm for the driven member of the gearing. 90

2. In a motor the combination with a driving shaft, means to drive the same and a gear wheel mounted on said shaft, of a spindle, a worm mounted on said spindle and meshing directly with said gear on said 95 driving shaft and driven thereby, a gear on said spindle, a governor and a governor shaft, a worm mounted on said governor shaft and meshing directly with said gear on said spindle and driven thereby. 100

3. In a motor, the combination of a casing, a horizontal spring driven shaft, a vertical worm gear thereon, a vertical shaft suitably journaled in said casing and pro- 105 vided with a worm near its lower end and a spur gear at its upper end, a governor, an inclined governor shaft journaled in brackets depending from the top of said casing, and a worm on said governor shaft meshing with said spur gear. 110

4. In a motor the combination with a driving shaft, means to drive the same, a spindle, a governor and a governor shaft, and gearing between said driving shaft and said spindle and between said spindle and 115 said governor shaft; the said gearing in said motor consisting of a gear wheel for the driving member of the gearing and a worm for the driven member of the gearing. 120

In witness whereof, I have hereunto set my hand this 10th day of November, 1904.

ELDRIDGE R. JOHNSON.

Witnesses:

JOHN F. GRADY,

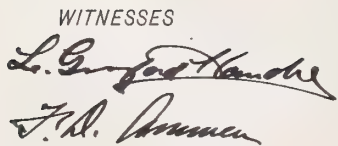
HORACE PETTIS.





**1,020,362.**

3 SHEETS—SHEET 1.



COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

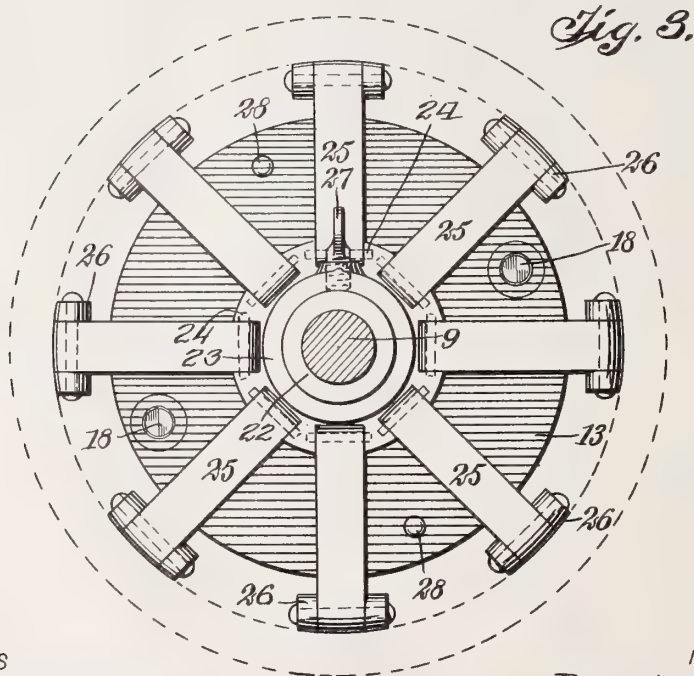
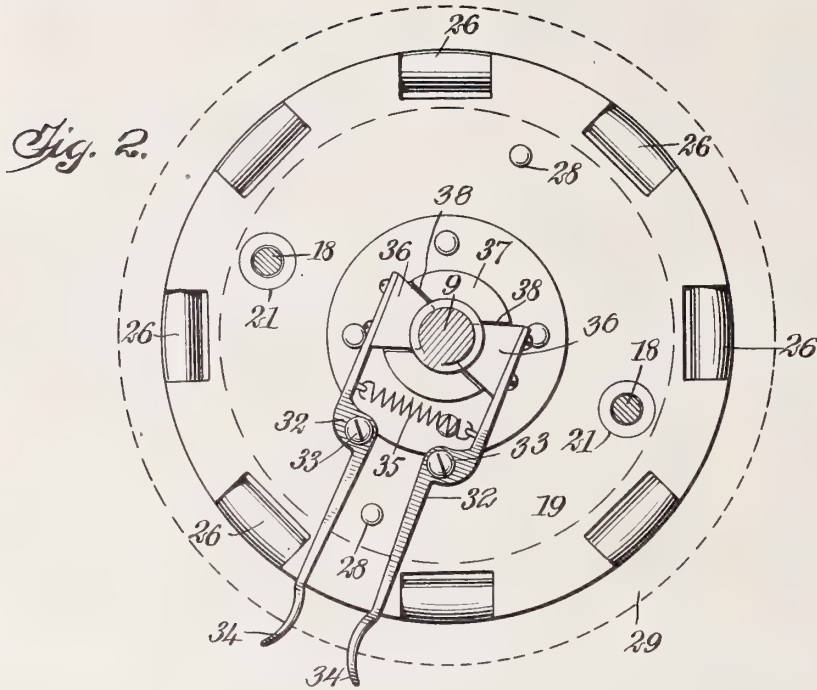


P. J. MUKAUTZ.  
 PHONOGRAPH ATTACHMENT FOR KINETOSCOPES.  
 APPLICATION FILED APR. 6, 1910.

1,020,362.

Patented Mar. 12, 1912.

3 SHEETS—SHEET 2.



WITNESSES

*L. G. Good*  
*F. D. Amman*

INVENTOR

*Peter J. Mukautz*

BY

*Mumford*

ATTORNEYS



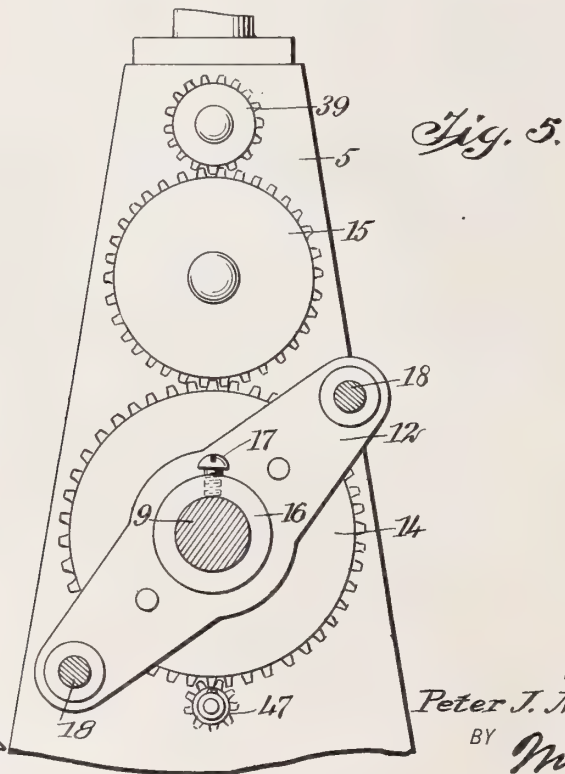
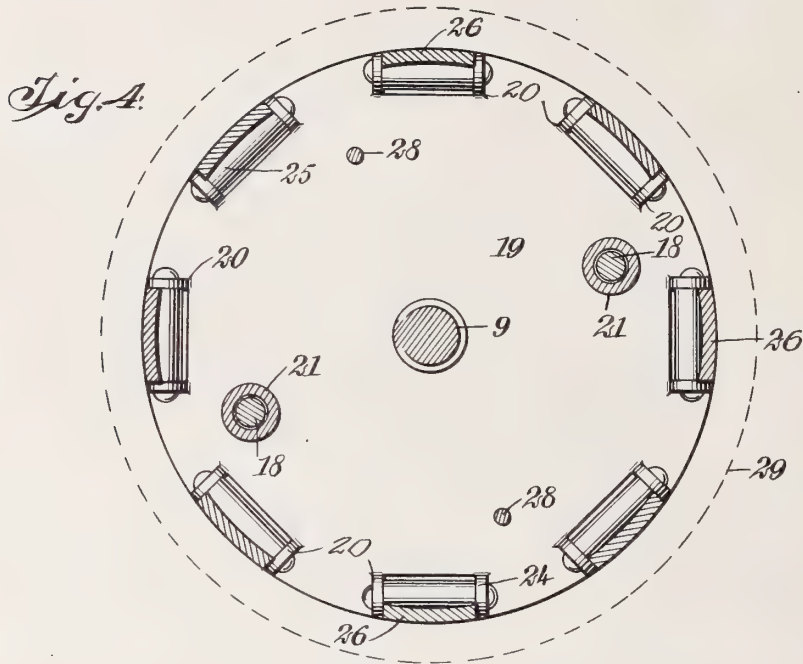


P. J. MUKAUTZ.  
 PHONOGRAPH ATTACHMENT FOR KINETOSCOPES.  
 APPLICATION FILED APR. 6, 1910.

1,020,362.

Patented Mar. 12, 1912.

3 SHEETS—SHEET 3.



WITNESSES

*L. G. ...*  
*J. D. ...*

INVENTOR

*Peter J. Mukautz*

BY

*Munroe*

ATTORNEYS

# UNITED STATES PATENT OFFICE.

PETER JOHN MUKAUTZ, OF KANSAS CITY, MISSOURI.

PHONOGRAPH ATTACHMENT FOR KINETOSCOPES.

1,020,362.

Specification of Letters Patent.

Patented Mar. 12, 1912.

Application filed April 6, 1910. Serial No. 553,717.

*To all whom it may concern:*

Be it known that I, PETER J. MUKAUTZ, a citizen of the United States, and a resident of Kansas City, in the county of Jackson and State of Missouri, have invented a new and Improved Phonograph Attachment for Kinetoscopes, of which the following is a full, clear, and exact description.

The invention relates to record holders for phonographs used in connection with kinetoscopes, the phonograph supplying the lines for the actors in the pictures projected by the kinetoscope.

The invention consists in the construction and combination of parts, to be more fully described hereinafter and particularly set forth in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the machine, certain parts of which are shown in section and broken away; Fig. 2 is a cross section on the line 2—2 of Fig. 1 and upon an enlarged scale; this view illustrates especially the construction of a clutch by means of which the record holder is thrown in or out of operation; Fig. 3 is a section on the line 3—3 of Fig. 1 and further illustrating the construction of the record holder; this view is also upon an enlarged scale; Fig. 4 is a cross section on the line 4—4 of Fig. 1 and further illustrating the construction of the holder; this view is upon an enlarged scale; Fig. 5 is a cross section on the line 5—5 of Fig. 1; this view is upon an enlarged scale; and Fig. 6 is a side elevation illustrating a shaft connection which I employ where the phonograph is located at a distance from the kinetoscope; this view is upon a reduced scale, and certain parts are broken away and shown in section.

Referring more particularly to the parts, 1 represents the frame of the machine, which is of elongated form, presenting a base 2 which rests upon a support such as a table, and an upwardly extending side plate 3. At one end, an end wall 4 is provided, adjacent to which there is placed a web or frame plate 5, disposed in a vertical position as indicated. At the opposite end of the frame, a bearing block 6 is mounted upon a pivot pin 7, and this bearing block is normally

held in an erect position by means of a suitable spring 8, as shown.

Rotatably mounted between the bearing 6 and the web 5, there is provided a shaft 9 held in a horizontal position as indicated. The extremity of the shaft adjacent to the bearing 6 is formed into a conical point 10 which is received in a conical bore 11 formed in the face of the bearing as shown. Adjacent to the web 5, a cross head 12 is attached to the shaft 9; a similar cross head 13 is provided near the middle portion of the shaft. The cross head 12 is rigidly attached to a main gear wheel 14, and this gear wheel meshes with a driving gear wheel 15 which is mounted on the frame plate 5 as shown. The cross head 12 is held against the frame plate 5 by a collar 16 which is held on the shaft 9 by a suitable set screw 17 as indicated most clearly in Fig. 5. The cross head 12 has oppositely projecting arms which are provided with longitudinally extending dog-bars 18. Upon these bars near the cross-head 12, as shown in Fig. 1, there is mounted a head 19, the construction of which is most clearly shown in Fig. 4; it consists of a circular plate having oppositely disposed ears 20 arranged in pairs around the periphery thereof. A sliding cross head 13 is provided, and between the head 13 and the head 19, tubular sleeves 21 are provided, which surround the dog-bars 18. Brace-bars 28 connect the heads 19 and 13 as shown.

The head 13 is of substantially circular form, and on its outer side is formed with a sleeve 22 carrying a loose collar 23 provided with laterally projecting ears 24 to which radial links 25 are pivotally attached, as shown, giving this part of the machine the form of a "spider". The links 25 operate as arms of the spider, as will be readily understood. The outer extremities of the links or arms 25 attach pivotally to longitudinally extending clamping bars 26, the opposite extremities whereof are pivotally attached between the ears 20, as indicated in Fig. 4.

The collar 23 is adjustable on the sleeve 22, and is adapted to be secured thereto at any desired point by means of a set screw 27. With this construction, it will be evident that if the collar 23 is forced toward the frame plate 5, it will operate to force the clamping bars 26 outwardly in such a way



as to enable them to clamp upon the inner side of a cylindrical record 29, indicated in dotted outline. Substantially the half portion of the shaft 9 which is disposed near the plate 5, is provided with screw threads 30, as shown in Fig. 1, and near the head 19 and on the outer side thereof, I provide a clutch 31, the construction of which is very clearly shown in Fig. 2. This clutch consists of two levers 32, which are disposed oppositely and pivoted at 33, the outer ends of the levers being formed into extensions 34 to receive the pressure of one's fingers. The inner ends of the levers are drawn together by a spring 35, and are provided with shoes 36 which have threaded faces and which engage with the threads of the shaft. Adjacent to the point where the shoes 36 are applied to the shaft, the head is provided with a collar 37 which is formed on the opposite sides with notches or recesses 38, as indicated, through which the shoes are applied.

With the driving gear 15 referred to above, a pinion 39 meshes on the upper side, and the shaft of this pinion is connected by bevel gears 40 with a vertical shaft 41, and this vertical shaft is driven through bevel gears 42 by a horizontal shaft 43 which extends out from the kinetoscope 44, the said kinetoscope being preferably mounted upon a horizontal plate 45 disposed at one end of the frame 1, as indicated. The shaft 43 is extended as shown, so as to enable the application of a crank 46 by means of which the phonograph and the kinetoscope may be simultaneously driven.

On the under side of the main gear wheel 14 a pinion 47 meshes, and this pinion is connected, through gearing 48, with a governor 49, of common construction, the said governor being provided with counterweights 50 which are adapted to fly outwardly so as to prevent racing of the machine. The weights 50 exert a certain amount of drag on the governor shaft and consequently on the speed of the record. The farther the weights are away radially from the governor shaft, the more drag will be exerted and the governor shaft will be slowed in proportion.

The mouth-piece 51 of the horn is mounted in a fixed position and carries a stylus 52, which is adapted to touch the face of the record in the manner indicated. When the device begins to operate, the record and record holder will occupy substantially the position in which they are shown in Fig. 1, the body of the record being disposed at the right of the stylus. When the clutch 31 is closed, however, and the machine started, the rotation of the main gear wheel 14 will drive the cross head 12 and the dog-bars 18 thereof will drive the head 19. As the rotation

takes place, the shoes 36 which are in engagement with the threads of the fixed shaft 9, operate to advance the record holder toward the left. In this way the entire record may be fed or made to pass under the stylus. The operation continues until the left-hand end of the record lies near the bearing 6 as indicated by the dotted lines at 53, at which time the dog-bars 18 will be nearly withdrawn from the sleeves 21. When it is desired to remove the record, this is accomplished by swinging the bearing block 6 toward the left by means of the thumb piece 54 which it carries. The thumb screw 27 is then unscrewed so as to enable the clamping bars 26 to be moved radially inward at one end. In this way the clamping bars 26 are withdrawn from the cylinder record, and the record may then be removed by a longitudinal movement.

Attention is called to the shaft connection extending between the kinetoscope and the phonograph. It will be understood, from this arrangement, that the kinetoscope and phonograph will move in unison, so that if the record is attached in the proper position with respect to the pictures which appear upon the screen, this correspondence will be maintained in such a way that when the actors are represented as moving about, the phonograph will repeat the words which the actors are supposed to have used.

It may happen that it is not convenient, in practice, to place the kinetoscope and phonograph attachment near together. Under these circumstances, I employ a connection of some kind between them, such as I have illustrated in Fig. 6. The arrangement illustrated consists of a shaft 55 which is formed in sections 56, the same being connected together by universal couplings 57, as illustrated. Near the ends of the shaft sections, suitable bearings 58 are provided, and the shaft sections are preferably inclosed in tubular sleeves or casings 59. With this arrangement, the kinetoscope and phonograph attachment may be at any distance apart desired, while a constant angular or synchronous relation will be maintained between them. Where it is not convenient to use the shaft shown in Fig. 6, I may synchronize the kinetoscope by other suitable means.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In a phonograph, in combination, a fixed shaft having screw threads formed thereupon, a head rotatably mounted on said shaft, a second head rotatably mounted on said shaft and carrying a sliding collar, links pivotally attached to said sliding collar and extending radially therefrom, clamping bars connecting said links with said first head, means for adjusting said

sliding collar, a clutch attached to said first head and engaging said screw threads, and a cross head affording means for driving said first head and having bars adapted to engage the same as it progresses longitudinally of said shaft.

2. In a phonograph, in combination, a fixed shaft having screw threads formed thereupon, a head rotatably mounted on said shaft, a cross head opposite said head and rotatably mounted on said shaft, a collapsible spider connected with said cross head and having radially projecting arms, clamping bars connecting said arms with the first named head, tubular members connecting said cross head with said first head, a driving cross head having bars extending longitudinally of said shaft and disposed within said tubular members, means for

driving said last cross head, and a clutch carried by said first head and adapted to engage said threads.

3. In a phonograph and in combination, a shaft, a head on the shaft, a movable cross head on the shaft, a collapsible spider connected with the cross head and having radially projecting arms, clamping bars connecting the arms with the first named head, a driving cross head, and a connection between the said driving cross head and the first-named head.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PETER JOHN MUKAUTZ.

Witnesses:

GORDON PERRY TORRANCE,  
THOMAS A. BRAY.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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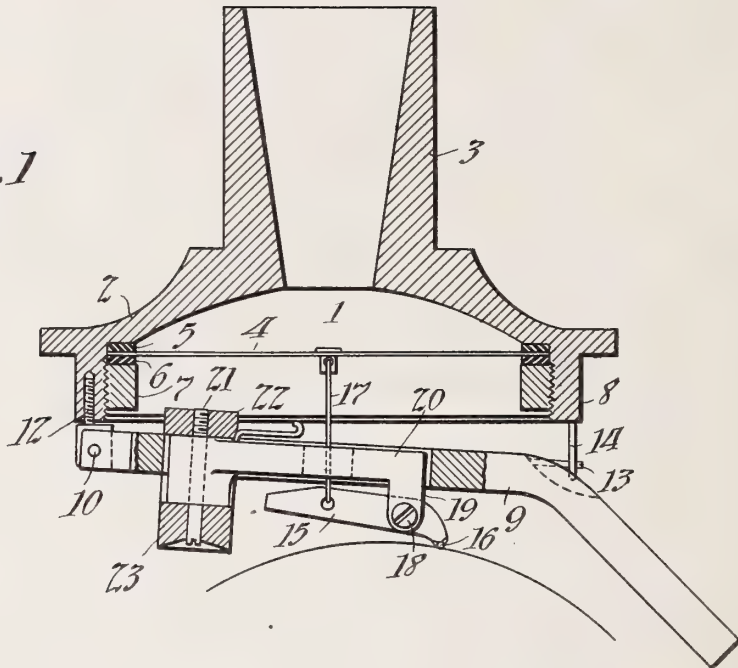
T. A. EDISON.  
PHONOGRAPH REPRODUCER.

APPLICATION FILED DEC. 29, 1908. RENEWED DEC. 7, 1911.

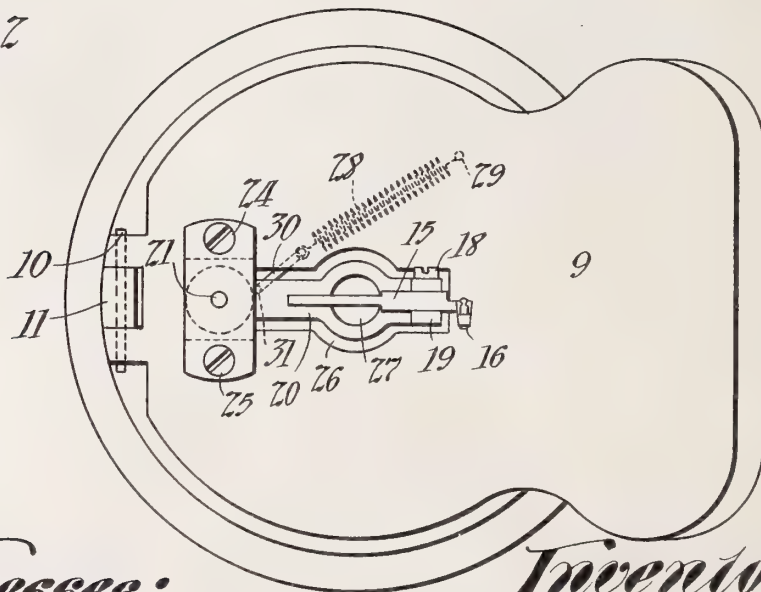
1,020,485.

Patented Mar. 19, 1912.

*Fig. 1*



*Fig. 2*



*Witnesses:*

*Francis D. Lewis*

*Dyer Smith*

*Inventor:*

*Thomas A. Edison*

*By Francis L. Dyer*  
*Att'y.*

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, WEST ORANGE, NEW JERSEY, ASSIGNOR  
TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A COR-  
PORATION OF NEW JERSEY.

## PHONOGRAPH-REPRODUCER.

1,020,485.

Specification of Letters Patent.

Patented Mar. 19, 1912.

Application filed December 29, 1908, Serial No. 469,886. Renewed December 7, 1911. Serial No. 664,493.

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, West Orange, Essex  
5 county, State of New Jersey, have invented a certain new and useful Improvement in Phonograph-Reproducers, of which the following is a clear, full, and concise description.

10 My invention relates to phonograph reproducers and has for its object the provision of an improved mounting for the stylus lever in order that the same may have great freedom of movement in tracking the  
15 grooves of the sound record, and in order that the defects due to inertia of the moving parts may be obviated.

More particularly, the object of my invention is to provide a mounting for the stylus,  
20 which shall permit the latter to be used in connection with records having two hundred threads to the inch, and track the same faithfully and without injury to the record or the stylus. While the stylus mounted in  
25 the manner of my invention is equally well adapted for use in connection with records having one hundred or some other number of threads per inch, the requirement of great facility of movement of the stylus  
30 lever both in a direction parallel to and transverse to the record groove, is particularly important in the case of the two hundred thread record or other record having a great number of threads per inch, owing  
35 to the thin walls between the record grooves, which might be broken down or jumped across by a stylus, the parts moving with which have considerable inertia, and owing to the character of the record grooves generally. Accordingly, a stylus mounting of the greatest freedom of lateral movement and the least possible inertia is very desirable. This is provided for in my inven-  
40 tion by mounting a comparatively light member pivotally on or in a recess in the floating weight, so that the said member may be free to rock upon its pivot in a plane nearly parallel with that of the diaphragm,

the said pivotally mounted member carrying the stylus lever pivoted thereto on a  
50 horizontal pivot. The stylus lever is thus free to oscillate in a plane at right angles to the plane of the diaphragm in response to the undulations of the record groove, and also is free to move laterally with the mem-  
55 ber to which it is pivoted with the very slight inertia belonging to the very light pivot member above referred to. It is to be noted that the floating weight to which this member is pivoted is itself mounted  
60 for a limited movement in planes substantially parallel to and crossing at right angles the plane of the diaphragm, as is common in the art. It is preferable to pivotally mount the member which carries the stylus  
65 lever at a point not far distant from the pivotal point of the floating weight.

A further object of my invention is to provide yielding means by which the pivot member and the stylus lever carried thereby  
70 may be normally held in a central position axial to the record groove tracked by the stylus.

Further objects of my invention are the provision of improved details of construc-  
75 tion and combination of parts.

In order that my invention may be better understood reference is hereby made to the accompanying drawings, forming part of this specification, in which—  
80

Figure 1 is a central vertical section through a reproducer equipped with my invention. Fig. 2 is a bottom view thereof.

The sound box 1 is formed by the member 2, which has formed integrally therewith  
85 the neck 3, to which the phonograph horn may be connected. The diaphragm 4 is clamped in position between gaskets 5 and 6, which are clamped in position between the body 2 of the reproducer and the ring 7,  
90 which bears screw threads on the periphery thereof, which are adapted to engage with screw threads on the interior of cylindrical vertical flange 8 of the phonograph body. The floating weight 9 is pivotally connected  
95 by a pin or screw 10 to a member 11 which



is pivotally mounted by means of the screw or short stud 12, which is secured in the flange 8 of member 2 of the reproducer, thus producing a floating weight which is free to oscillate to a certain extent in a direction crossing the plane of the diaphragm, and also in a plane substantially parallel to that of the diaphragm in a manner well known in the art. The pin 13 extending from the periphery of the floating weight at a point diametrically opposed to the pivot of said weight, and engaging within the stirrup 14, which extends from the adjacent point of the flange 8 of the body of the reproducer, limits the movements of the floating weight in the various directions possible to it, in a manner well known in the art.

The stylus lever 15 carries the stylus 16, and is connected by link 17 to the diaphragm, the link 17 being attached to the said diaphragm in a manner well known. Stylus lever 15 is pivotally mounted as on screw or pin 18, which is supported in the ears or lugs 19, depending from member 20, which is pivoted on screw or pin 21, which is mounted in an approximately vertical position in the floating weight. Pivot pin 21 for the member 20 is held securely in place by means of blocks or lugs 22 and 23 on the upper and under sides of weight 9, which are held in position as by screws 24 and 25. Member 20 is preferably mounted within the recess or opening 26 cut in the floating weight, which is preferably shaped to correspond to the exterior of member 20, and to allow the latter sufficient lateral movement therein. Member 20 is provided with a central vertical passageway 27, through which passes the link 17. Member 20 is normally held in its central position in which the stylus is maintained axially in the record groove which it is tracking, by any convenient yielding means as by the spiral spring 28, which is secured to the floating weight at 29 at one end, and at the other end to a short link 30, which is screwed to member 20 at the point 31. This spring is so adjusted and is secured at such an angle that it is only free from stress when member 20 is in its central position. Movement of member 20 to either side of its central position flexes the spring to one side or the other of its neutral position, thereby putting it under stress to return the member 20 to its central position with a gentle force, as soon as whatever force may be acting to move the member 20 from its central position ceases.

It is understood that my invention is not limited to the precise device or construction shown, but may be varied within the scope of the appended claims without departing from the spirit of my invention.

Having now described my invention, what I claim and desire to secure by Letters Patent of the United States is as follows:

1. In a phonograph reproducer, the combination with a diaphragm, of a floating weight, an elongated member mounted at one end on said floating weight and free to turn relatively to the same in a plane nearly parallel with the plane of said diaphragm, a stylus lever connected to said diaphragm and pivotally mounted upon the opposite end of said member to rock in a direction crossing the plane of said diaphragm, said diaphragm connection being intermediate said member and lever pivots, and yielding means connected to said weight and member for normally holding said member in a position parallel with the axis of the record groove and returning it to such position after the cessation of any force tending to move it therefrom, substantially as described.

2. In a phonograph reproducer, the combination with a diaphragm, of a floating weight, an elongated member pivoted at one end on said floating weight and free to turn relatively to the same in a plane nearly parallel with the plane of said diaphragm, a stylus lever connected to said diaphragm and pivotally mounted upon the opposite end of said member to rock in a direction crossing the plane of said diaphragm, said diaphragm connection being intermediate said member and lever pivots, and a spring connected to said member and weight for normally holding said member in a position axial of said weight and being under stress as the said member is moved either to one side or the other of said normal position, substantially as described.

3. In a phonograph reproducer, the combination with a sound box having a diaphragm mounted therein, of a floating weight mounted on said sound box, a member mounted on said floating weight free to turn relatively to the same in a plane nearly parallel with the plane of the diaphragm, a stylus lever connected to said diaphragm and pivotally mounted on said member, and yielding means connected to said weight and member for normally holding said member in a position parallel with the axis of the record groove and returning it to such position after the cessation of any force tending to move it therefrom, substantially as described.

4. In a phonograph reproducer, the combination with a sound box having a diaphragm mounted therein, of a floating weight mounted on said sound box, a member mounted on said floating weight, free to turn relatively to the same in a plane nearly parallel with the plane of the dia-

phragm, a stylus lever connected to said diaphragm and pivotally mounted on said member, a link secured to said member and yielding means connected to said link and  
5 weight and normally in alinement with said link, said means normally holding said member in a position parallel with the axis of the record groove and returning it to such position after the cessation of any force

tending to move it therefrom, substantially 10 as described.

This specification signed and witnessed this 21st day of December, 1908.

THOS. A. EDISON.

Witnesses:

DYER SMITH,

ANNA R. KLEHM.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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J. W. NELSON.  
 AUTOMATIC CUT-OFF FOR TALKING MACHINES.  
 APPLICATION FILED MAR. 4, 1911.

1,021,109.

Patented Mar. 26, 1912.

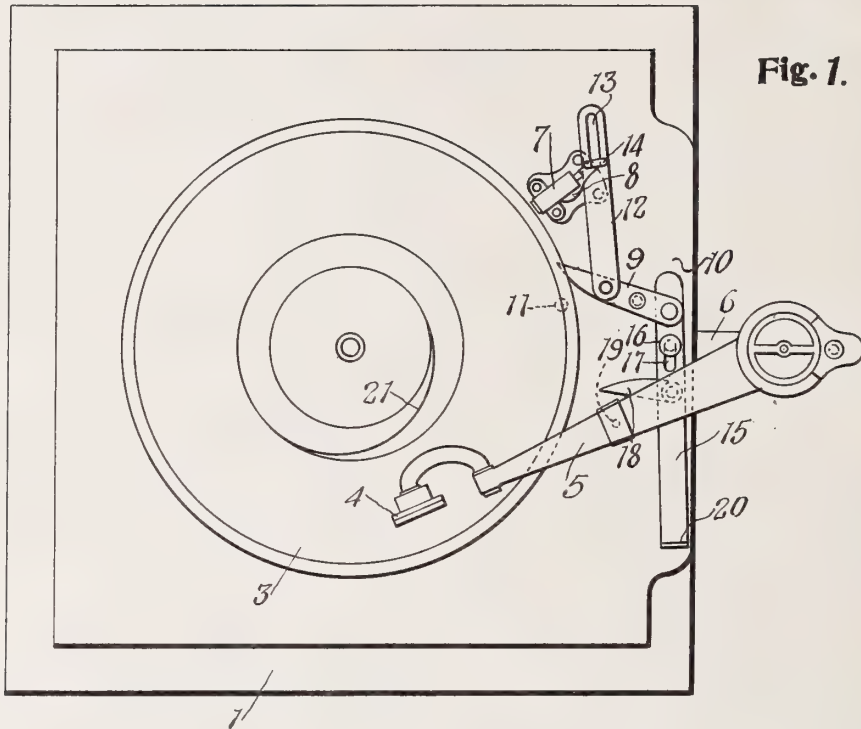


Fig. 1.

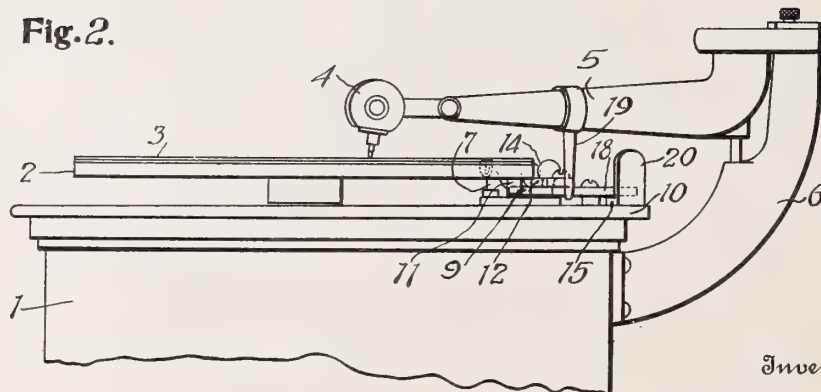


Fig. 2.

Inventor

James W. Nelson,

Witnesses,  
 G. Howard Walmsley,  
 Edward L. Reed.

By A. A. Coulman,  
 Attorney

# UNITED STATES PATENT OFFICE.

JAMES W. NELSON, OF MARION, OHIO, ASSIGNOR OF ONE-HALF TO DELPHOS C. NELSON,  
OF MARION, OHIO.

## AUTOMATIC CUT-OFF FOR TALKING-MACHINES.

1,021,109.

Specification of Letters Patent.

Patented Mar. 26, 1912.

Application filed March 4, 1911. Serial No. 612,290.

*To all whom it may concern:*

Be it known that I, JAMES W. NELSON, a citizen of the United States, residing at Marion, in the county of Marion and State of Ohio, have invented certain new and useful Improvements in Automatic Cut-Offs for Talking-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to automatic cut-offs for talking machines and the object of the invention is to provide a brake-operating mechanism which will be positive in all its actions, thereby insuring its proper operation and the stopping of the record at the proper time.

It is a further object to provide such a device which will be very simple in its construction and operation and which can be manufactured at a low cost.

In the accompanying drawings, Figure 1 is a top, plan view of a talking machine equipped with my invention; and Fig. 2 is a side elevation of the same.

In these drawings I have illustrated one embodiment of the invention and have shown the same as applied to a talking machine of a well known character and comprising a motor casing 1 upon which is mounted a rotatable support, such as a turntable 2, which carries the record 3, which, in this type of machine, is in the form of a disk. The sound reproducing device 4 is supported above and adjacent to the turntable and the record carried thereby by means of an arm 5 which is pivotally supported on a bracket 6 secured to one side of the motor casing or supporting frame 1. As the sound reproducing device 4 travels inward along the spiral groove constituting the record the arm 5 will move about its pivotal center, and, in carrying out my invention, I utilize this swinging movement of the arm to impart movement to the brake-actuating mechanism. Any suitable type of stop may be employed, and, in the present instance, I have shown the same as comprising the usual brake 7 which is supported on the motor casing and has a friction plunger to engage the edge of the turntable and check the movement of the latter. This brake is controlled by means of a lever 8 which, in the ordinary operation of the device, is controlled by hand. In the present instance I have provided a brake-actuating member

which is operatively connected with the brake 7 through the medium of the lever 8 and is adapted to be engaged by a part carried by the turntable. The brake-actuating member is normally supported out of the path of the part carried by the turntable but is moved into the path of such part by the movement of the arm 5 as the reproducer 4 travels over the record. The construction of the several parts of the mechanism for accomplishing this result may take various forms but, in the present instance, the brake-operating member comprises a lever 9 pivotally mounted on a suitable support, such as an extension 10, secured to the motor casing adjacent to the bracket 6 carrying the arm 5. One end of the lever 9 is arranged normally at a point adjacent to the edge of the turntable but out of the path of the part carried thereby. This part, in the present instance, comprises a pin 11 depending from the lower side thereof. The actuating member or lever 9 is operatively connected with the brake by means of a rod 12 loosely connected to the lever 8. The loose connection between the rod 12 and the lever 8 permits the actuating member to be moved into the path of the pin 11 before the operative connection between the rod and the lever is established.

The connection between the rod and the lever may be of any suitable character but, in the present instance, the rod is provided with a longitudinal slot 13 adapted to extend about the lug 14 usually found on the lever of a brake of this character, thereby enabling the device to be attached to the ordinary brake without modification of the latter. The connection between the actuating member 9 and the arm 5 preferably comprises a movable member or bar 15 slidably mounted on the extension 10, preferably by means of a pin 16 extending through a slot 17 formed in the bar. This bar is connected to the lever 9 on that side of its pivotal center opposite the point of connection of the rod 12 and is provided with a laterally extending lug 18 which is arranged in the path of a finger 19 depending from the arm 5.

As the reproducing device 4 approaches the end of the record the movement of the arm 5 about its pivotal center will cause the finger 19 to engage the lug 18 and move the bar 15 longitudinally. This movement of



the bar causes the actuating member 9 to swing about its pivotal center to bring the inner end thereof into the path of the pin 10 carried by the turntable. This pin engaging the end of the actuating member causes the brake 7 to be actuated and the movement of the turntable and record checked. The brake, as above stated, is a friction brake and the checking of the turntable is gradual and not instantaneous. This gradual stopping of the turntable is permitted by allowing the actuating member 9 to move about its pivotal center a distance sufficient to carry the inner end of the same again out of the path of the pin 11. The bar 15 may be manipulated by hand to restore the actuating member 9 to its normal position and release the brake 7, thereby again permitting the turntable to rotate. To this end the bar 15 is preferably provided with a finger piece or lug 20 arranged on the side of the arm 5, and the horn which is connected therewith, opposite the brake and within convenient reach of the operator. In order to impart the necessary movement to the bar 15 and actuating member 9 quickly when the end of the record has been reached I have here shown the record as provided with a groove 21 extending inward from the end of the record and described about a center other than the center of the record, thus causing the reproducing device and the arm to be carried inward quickly when the end of the record has been reached.

It will be apparent from the foregoing description and the accompanying drawings that my device, while of exceeding simplicity and comprising a very few parts, is positively actuated throughout its movement and will operate with a high degree of efficiency. The actual movement is imparted to the brake lever positively by means of the pin on the turntable engaging the brake-actuating member 9 and this brake-actuating member is positively moved by the arm 5 to carry the same into position to be engaged by the pin on the turntable.

While I have herein shown and described one form of my invention it will be understood that this form has been chosen for the purpose of illustration only and that I do not wish to be limited to the details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a device of the character described, the combination, with a movable support for a record, a device to control the movement of said support, and a sound-reproducing device supported adjacent to said record-support and movable relatively thereto, of an

actuating member operatively connected to said controlling device, a part carried by said record-support to engage said actuating member, a movable member connected with said actuating member, and a device positively actuated by the movement of said reproducing device to impart movement to said movable member and move said actuating member into a position to be engaged by said part on said record-support.

2. In a device of the character described, the combination, with a turntable having a projection, a brake to control the movement of said turntable, a sound-reproducing device, and a movable arm to support said device adjacent to said turntable, of an actuating member supported normally out of the path of the projection on said turntable, and means positively actuated by the movement of said arm to move said actuating member into the path of said projection.

3. In a device of the character described, the combination, with a turntable having a projection, a brake to control the movement of said turntable, a sound-reproducing device, and a movable arm to support said device adjacent to said turntable, of a brake-actuating member pivotally supported with one end adjacent to said turntable but normally out of the path of said projection, and means positively actuated by the movement of said arm to move said actuating member about its pivotal center and into the path of said projection.

4. In a device of the character described, the combination, with a turntable having a projection, a brake to control the movement of said turntable, a sound-reproducing device, and a movable arm to support said device adjacent to said turntable, of a brake-actuating member supported normally out of the path of the projection on said turntable, a movable bar operatively connected with said actuating member, and a part carried by said arm to positively actuate said bar and move said brake-actuating member into the path of said projection.

5. In a device of the character described, the combination, with a turntable having a projection, a brake to control the movement of said turntable, a sound-reproducing device, and a movable arm to support said device adjacent to said turntable, of a brake-actuating member pivotally supported with one end adjacent to said turntable but normally out of the path of said projection, a longitudinally movable bar connected with said actuating member, a lug projecting from said bar, and a finger carried by said arm and arranged to engage said lug to move said actuating member into the path of the projection on said turntable.

6. In a device of the character described, the combination, with a turntable having a projection, a brake to control the movement

of said turntable, a sound-reproducing device, and a movable arm to support said device adjacent to said turntable, of a brake-actuating member pivotally supported with  
5 one end adjacent to said turntable but normally out of the path of said projection, a longitudinally movable bar connected with said actuating member, a lug projecting from said bar, a finger carried by said arm  
10 and arranged to engage said lug to move said actuating member into the path of the projection on said turntable, and a finger piece on said bar to return said actuating member to its normal position.  
15 7. In a device of the character described, the combination, with a turntable having a projection, a brake to control the movement of said turntable, a sound-reproducing device, and a movable arm to support said de-  
20 vice adjacent to said turntable, of an actu-

ating member pivotally mounted adjacent to said turntable and having its inner end normally out of the path of the projection thereon, a rod connected at one end to said actuating member and loosely connected at  
25 its other end with said brake, a slidable bar connected with said actuating member on that side of its pivotal center opposite the point of connection with its rod, a lug carried by said slidable bar, and a finger car-  
30 ried by said arm and adapted to engage said lug to move said actuating member about its pivotal center.

In testimony whereof, I affix my signature in presence of two witnesses.

JAMES W. NELSON.

Witnesses:

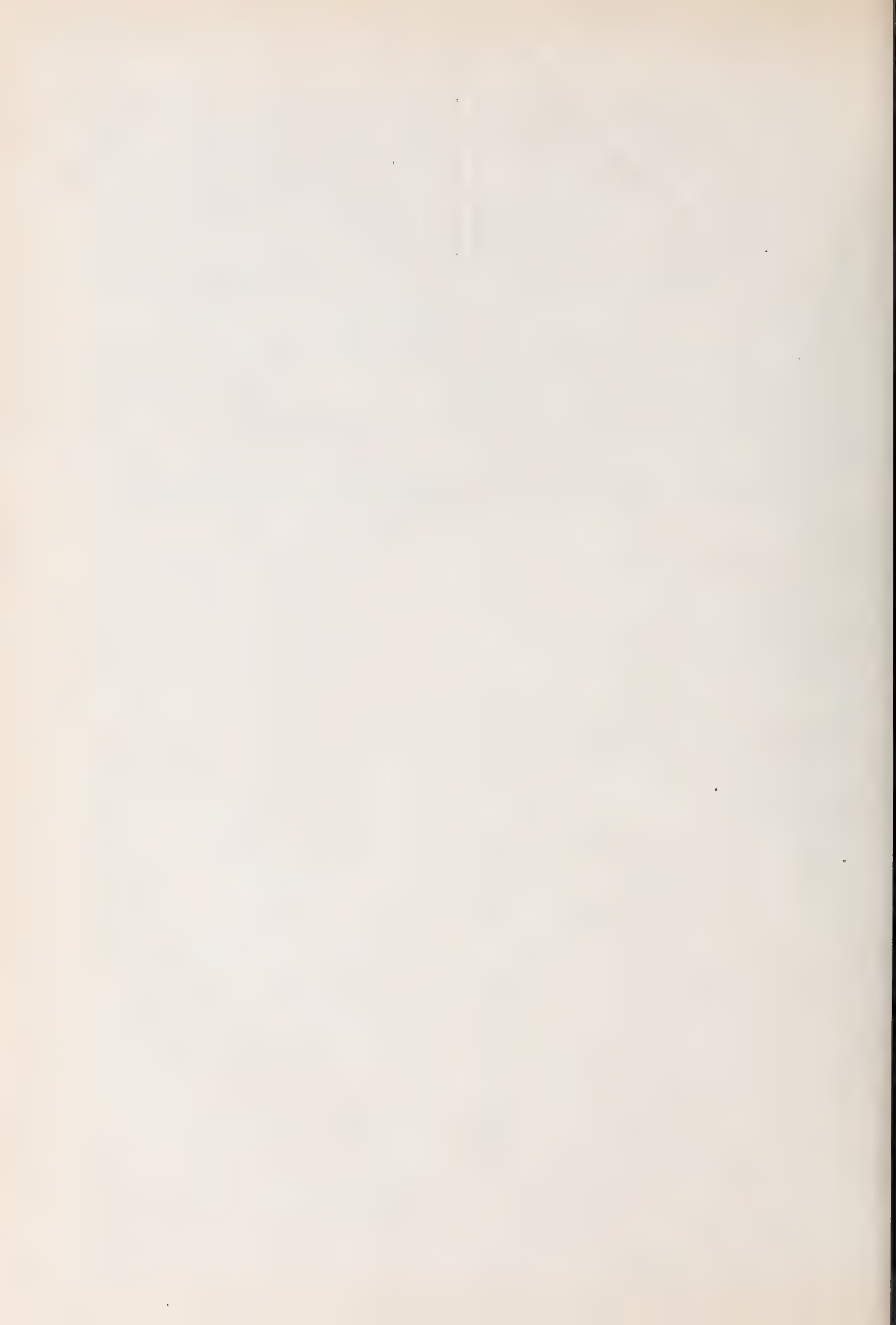
McCLAIRE DARMODY,  
CHARLES L. JUSTICE.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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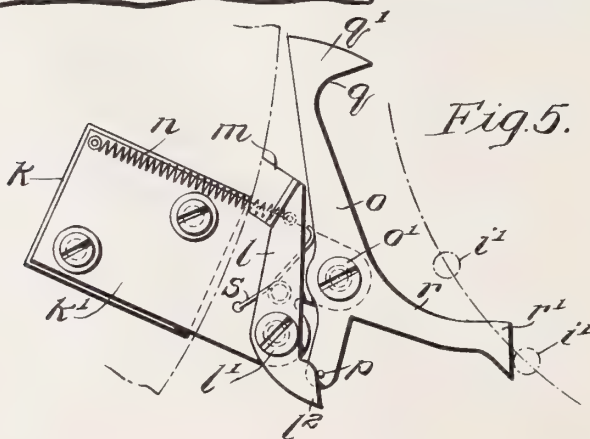
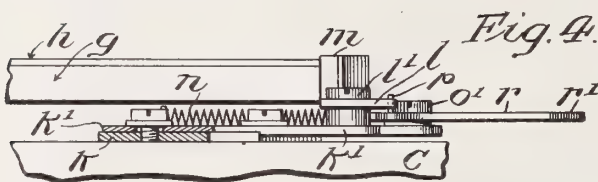
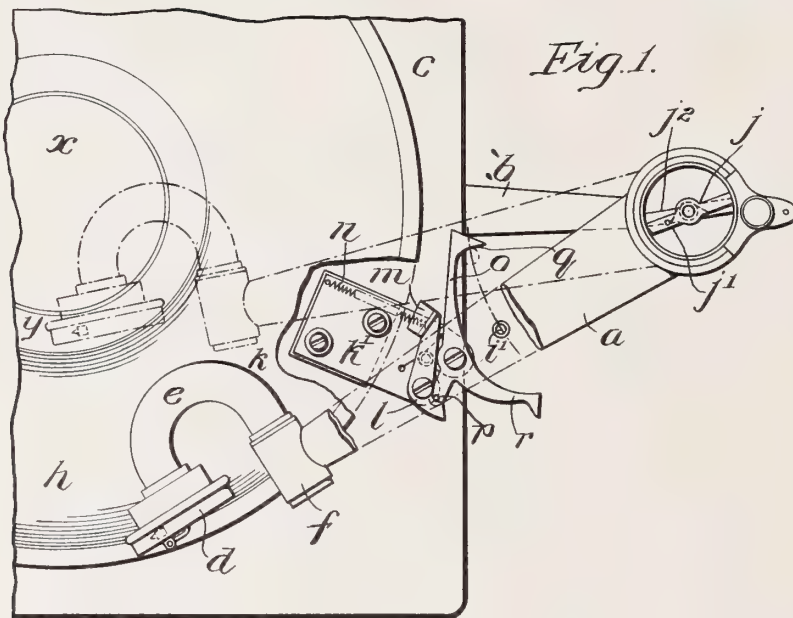


T. BIRNBAUM.  
 AUTOMATIC BRAKE FOR TALKING MACHINES.  
 APPLICATION FILED NOV. 15, 1909.

1,021,756.

Patented Apr. 2, 1912.

3 SHEETS-SHEET 1.



WITNESSES

*F. J. Hartman*  
*Robert E. Moulton*

BY

*Theodore Birnbaum*

ATTORNEY



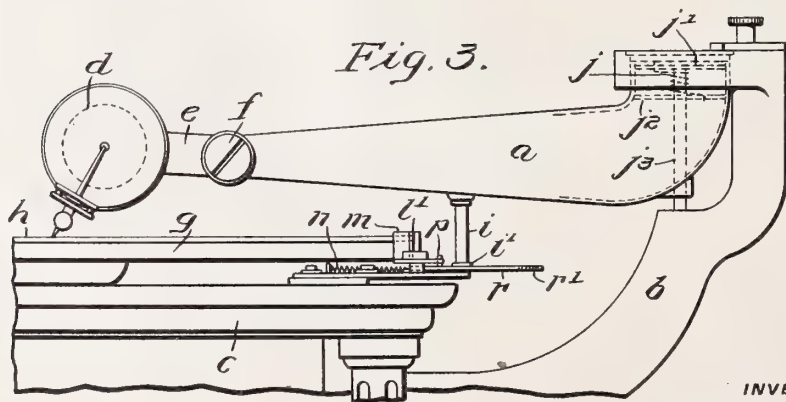
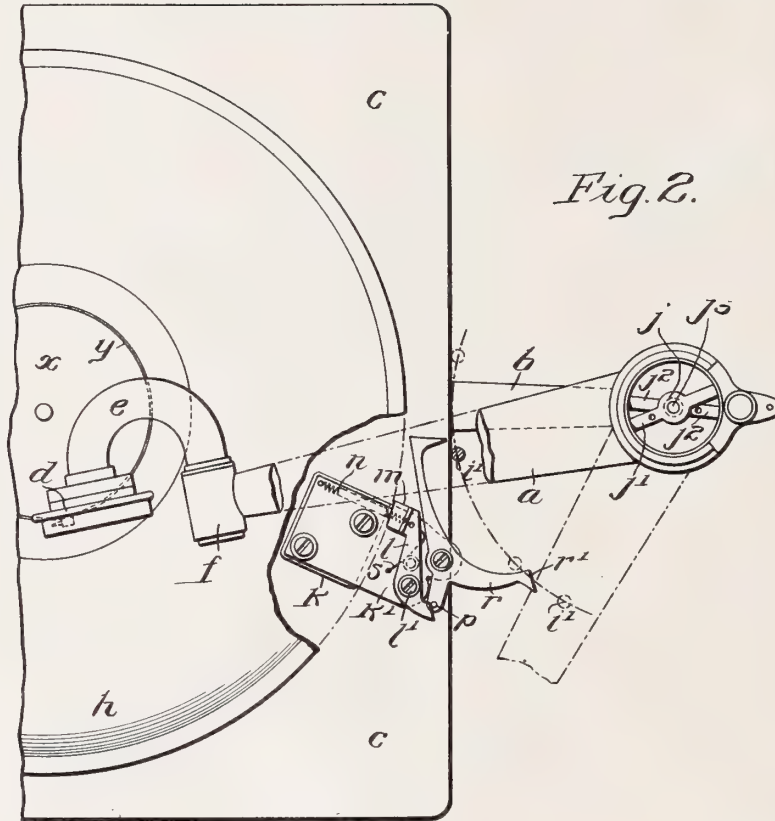


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3 SHEETS—SHEET 2.



INVENTOR

Theodore Birnbaum.

WITNESSES

H. G. Hartman.

Harold B. Moulton.

BY

Harold B. Moulton.

ATTORNEY

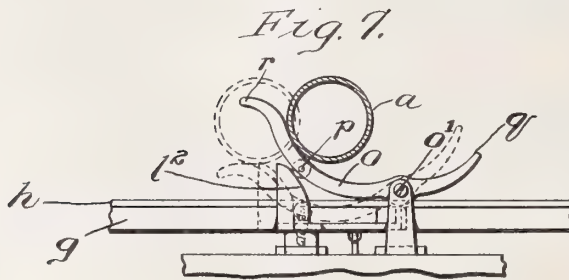
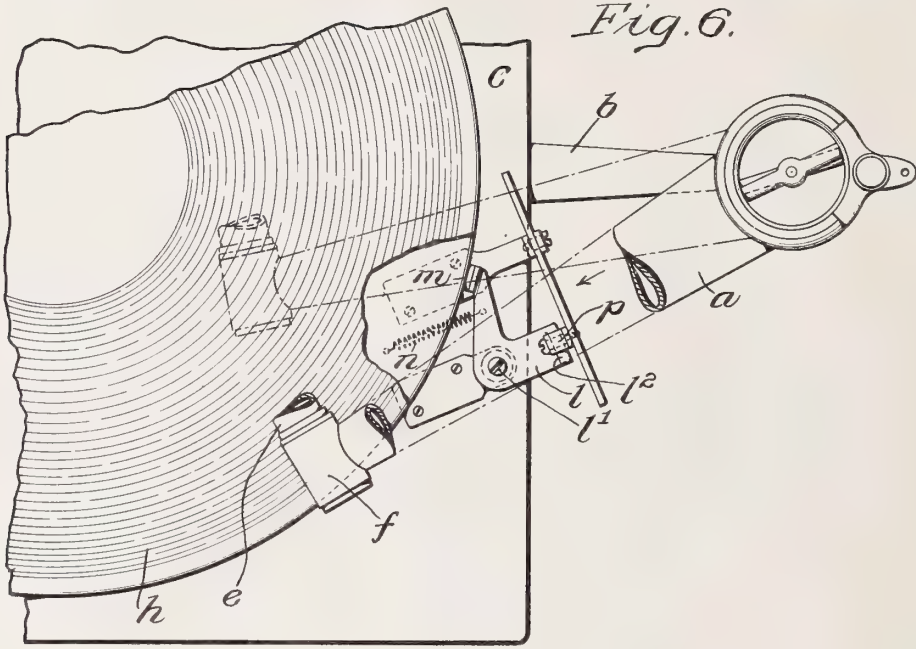


T. BIRNBAUM.  
 AUTOMATIC BRAKE FOR TALKING MACHINES.  
 APPLICATION FILED NOV. 15, 1909.

1,021,756.

Patented Apr. 2, 1912.

3 SHEETS—SHEET 3.



WITNESSES  
*H. J. Hartman.*  
*A. J. Gardner.*

INVENTOR  
*Theodore Birnbaum.*  
 BY *Horace C. [Signature]*  
 ATTORNEY

# UNITED STATES PATENT OFFICE.

THEODORE BIRNBAUM, OF LONDON, ENGLAND, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

## AUTOMATIC BRAKE FOR TALKING-MACHINES.

1,021,756.

Specification of Letters Patent.

Patented Apr. 2, 1912.

Application filed November 15, 1909. Serial No. 528,039.

*To all whom it may concern:*

Be it known that I, THEODORE BIRNBAUM, a subject of the King of Great Britain, and a resident of the city of London, England, have invented certain new and useful Improvements in Automatic Brakes for Talking-Machines, of which the following is a specification.

The present invention relates to an improved automatic brake for gramophones and similar talking machines.

According to this invention a brake is provided which will automatically stop the machine when the selection has been played and the brake may either be operated by putting sidewise pressure on the sound arm as it reaches the end of the selection, in the manner proposed with other known constructions of automatic brake, or this sidewise pressure may be dispensed with and the record furnished with an auxiliary spiral, in well known manner, running from the end of the sound line to a circular track around the center of the record.

A further feature of the invention is that the brake can be taken off, so as to start the machine running, by bringing the sound arm back to the starting position, that is the position which will bring the reproducing needle to the commencement of the sound line.

My invention is illustrated in one form in the accompanying drawings.

Figure 1 is a plan view of part of a disk talking machine fitted with the improved brake, the brake being shown in the off position. Fig. 2 is a similar view, but with the brake on. Fig. 3 is a side elevation of Fig. 2. Figs. 4 and 5 are side elevation (partly in section) and plan respectively of the brake on an enlarged scale. Fig. 6 is a top plan view of a modified form of this invention, and Fig. 7 is a fragmentary front elevation of a portion of the same, looking in the direction of the arrow in Fig. 6.

The sound arm *a* is carried in the usual way, pivoted in the bracket *b* which is fixed rigidly on the cabinet *c*. The sound box *d* is carried in the usual manner by the semi-circular piece *e* jointed to the sound arm at *f*. The turntable *g* is shown carrying a record *h*. From the sound arm there extends downward a pin *i*, with a roller *i*<sup>1</sup> at its lower end. In the machine shown in the drawings, there is arranged within the sound

arm, at its bearing a coiled spring *j*, which tends to throw the sound arm across the record toward the center. One end of this spring is secured to the upper of the two cross pieces *j*<sup>1</sup> *j*<sup>2</sup> through which the bearing pivot *j*<sup>3</sup> passes, and after passing three or four times around the pin, the other end of the spring is fixed to the lower cross piece.

On the top of the cabinet *c* is screwed the plate *k*, and secured thereto, but so as to be capable of lateral adjustment is the second plate *k*<sup>1</sup>; upon the plate *k*<sup>1</sup> are pivoted so as to swing horizontally two levers; one *l*, turning about a pivot *l*<sup>1</sup> is furnished at one end with a brake pad *m*, which is pulled against the side of the turntable *g* by the spring *n*, and at the other end the lever *l* is formed with a cam face *l*<sup>2</sup>, (Fig. 5). The second lever *o*, turning about a pivot *o*<sup>1</sup>, has three arms, one is furnished with a pin *p*, which bears on the cam face *l*<sup>2</sup> of lever *l*, and may advantageously be provided with a roller to reduce friction, the second arm has a projecting finger *q* which normally stands in the path of the pin *i* on the sound arm, and the third arm *r* is an extension by means of which the brake can be put into the off position by moving the sound arm outward or away from the center of the record. A spring *s* bears lightly on the lever *o* and tends to hold the pin *p* up against the cam face *l*<sup>2</sup>, when the brake is on.

The operation of the device is as follows: A record is placed on the turntable and the sound arm is moved outward away from the record, into the position shown in dotted lines in Fig. 2. This brings the roller *i*<sup>1</sup> carried by the pin *i* up against the arm *r* so that it pushes back the latter into the position shown in Fig. 1 and so causes the pin *p* to ride up the cam face *l*<sup>2</sup> of the lever *l*, and bring the brake pad *m* away from the turntable. The arm *r* is preferably made of such length that on the roller *i*<sup>1</sup> pressing it back to the full extent, the pin *p* will be brought to rest on the top of the cam surface *l*<sup>2</sup>, so as to remain there till displaced. The turntable having started on the removal of the brake pad *m*, the needle of the sound box is placed on the record, at the beginning of the sound line, the several parts of the apparatus now occupying the position shown in full lines in Fig. 1. As the needle follows the sound line, the sound arm gradually approaches the center of the rec-



ord. On the needle reaching the end of the sound line the resistance of the sides of the sound groove is removed and the spring *j* throws the arm *a* farther toward the center of the record. Just before the needle, sliding over the smooth unrecorded portion of the record, reaches the circular label in the center, indicated by *x* in the drawings, the roller *i*<sup>1</sup> strikes the projecting finger *q* on the lever *o*, as shown in dotted lines in Fig. 1; this trips the lever *o*, and dislodges the pin *p* from its position, so that the lever *l* is released and the spring *n* pulls the brake pad *m* against the turntable *g*, and stops the machine.

The record *h* is usually furnished with a slightly raised ridge *y* running around the central label, and this prevents the needle from being thrown by the spring *j* on to the label. The possibility of this occurring may further be obviated by making the projecting finger *q* of such shape that when the needle has reached the ridge *y*, the roller *i*<sup>1</sup> lies against the point of the finger *q*, and to pass it has to overcome the spring *s*. This spring *s* is so placed as not to press on the lever *o* when the brake is in the off position, but only when the brake is on and the lever *o* is in the position shown in Figs. 2 and 5.

If the sound arm is carried beyond the position shown in full lines in Fig. 2, then whether the brake is in the off position or in the on position, that is, in the position shown in Figs. 1 or 2, the sound arm can always be returned to its starting position, for the outside face *q*<sup>1</sup> (Fig. 5) of the finger *q* is made beveled, so that the roller *i*<sup>1</sup> will ride up it and force the lever *o* back. In the same way, if when the sound arm is brought out away from the record to the position shown in dotted lines in Fig. 2, the brake is put on and the arm *r* so brought again into the path of the roller *i*<sup>1</sup>, the sound arm can be returned to the position for playing a record, for the roller *i*<sup>1</sup> will ride up the beveled face *r*<sup>1</sup> (see Fig. 5). There is thus no risk of the sound arm striking the brake so as to damage it or put it out of order.

The object of having the levers *l* and *o* pivoted on a plate which is adjustable on the cabinet is to allow of the accurate positioning of the brake with regard to the pin *i* on the sound arm, without damaging the cabinet. The plate *k* is first secured to the cabinet so as to bring the lever *o* into approximately the correct position, and then, the exact position having been obtained, the plate *k*<sup>1</sup> is clamped down on to the plate *k*.

It will be obvious that for playing records that are furnished with an auxiliary spiral groove or run out in well known manner, the spring pressure upon the sound arm can be dispensed with. In this case

the runout spiral will draw the needle to the edge of the label when the selection is finished, and so cause the pin *i* to trip the lever *o*.

The brake may of course be made as above described, but without the arm *r*; I prefer however to make it with this arm as the machine can then be started and the sound box brought into the correct position for commencing the reproduction by a single movement.

If it is preferred to dispense with the pin *i* in the sound arm, the lever *o* may be arranged to swing vertically, as shown in Figs. 6 and 7 and in this case will be tripped by the sound arm itself. The cam surface *l*<sup>2</sup> in this construction would have to rise vertically, so that the pin *p* as it rose and fell might operate the lever *l*.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a talking machine, the combination with a rotary record support, of movable sound reproducing means, means for braking said record support normally held in engagement therewith, controlling means actuated by the said reproducing means and movable about a fixed axis independently of said braking means and of said reproducing means for rendering the braking means inoperative when said sound reproducing means is moved from an inoperative position to a starting position, and for bringing said braking means into operation as said sound reproducing means reaches the inner end of its reproducing path.

2. In a talking machine, the combination with a rotary record support, of movable sound reproducing means, means for braking said record support normally held in engagement therewith, controlling means actuated by the said reproducing means and movable about a fixed axis independently of said braking means and of said reproducing means for rendering the braking means inoperative when said sound reproducing means is moved inwardly from an inoperative position to a starting position, and for bringing said braking means into operation as said sound reproducing means reaches the inner end of its reproducing path.

3. In a talking machine, the combination with a rotary record support, of movable sound reproducing means, means for braking said record support normally held in engagement therewith, controlling means actuated by the said reproducing means and movable about a fixed axis independently of said braking means and of said reproducing means for rendering the braking means inoperative when said sound reproducing means is moved outwardly from an inoperative position to a starting position, and for bringing said braking means into operation

as said sound reproducing means reaches the inner end of its reproducing path.

4. In a talking machine, the combination with a rotary record support, of movable  
5 sound reproducing means, means for braking said record support normally held in engagement therewith, controlling means actuated by the said reproducing means and movable about a fixed axis independently  
10 of said braking means and of said reproducing means for rendering the braking means inoperative when said reproducing means is moved either inwardly or outwardly from an inoperative position to a starting position,  
15 and for bringing said braking means into operation as said sound reproducing means reaches the inner end of its reproducing path.

5. In a talking machine, the combination  
20 with a rotary turntable, of sound reproducing means, a pivoted swinging arm carrying said sound reproducing means, a brake lever pivoted upon a fixed axis and having a brake shoe normally held in engagement with said turntable, a controlling  
25 lever pivoted upon a fixed axis spaced from the fixed axis of said brake lever and actuated by the movement of said sound reproducing means and movable independently  
30 of said arm, and means carried by and projecting from said arm and adapted to engage said controlling lever to render said brake lever inoperative when said sound reproducing means is moved from an inoperative position to a starting position.

6. In a talking machine, the combination with a rotary turntable, of sound reproducing means, a swinging pivoted arm carrying  
40 said sound reproducing means, braking means normally engaging said turntable, a controlling lever pivoted upon a fixed axis, and normally out of engagement with said arm but actuated by the movement of said  
45 arm in one direction, first to render said braking means inoperative and then to render the same operative, said controlling lever being actuated by the movement of the said arm in the opposite direction to render said brake inoperative.

7. In a talking machine, the combination with a rotary record support, of movable  
50 sound reproducing means, braking means for said turntable, and means operatively connected only at predetermined intervals to be actuated by the movement of said sound  
55 reproducing means in one direction, first to render said braking means inoperative and then to render the same operative, and rendered inoperative by the movement of said  
60 sound reproducing means in the opposite direction.

8. In a talking machine, the combination with a rotary turntable, of movable sound  
65 reproducing means, braking means for said turntable, and controlling means operatively

connected at predetermined intervals to be actuated by the movement of said sound reproducing means either inwardly or outwardly with respect to said table adjacent the starting point of said sound reproducing means for rendering said braking means  
70 inoperative, said controlling means being retained in inoperative position independently of said reproducing means.

9. In a talking machine, the combination  
75 with a rotary turntable, of movable sound reproducing means, braking means for said turntable, and controlling means normally free from said sound reproducing means but operatively connected at predetermined intervals to be actuated by the movement of  
80 said sound reproducing means either inwardly or outwardly with respect to said table adjacent the starting point of said sound reproducing means for rendering said  
85 braking means inoperative, said controlling means being also actuated by the inward movement of said sound reproducing means adjacent the inner end of its path to render said braking means operative.

10. An automatic brake for gramophones and similar talking machines comprising in combination a turntable, a horizontally  
90 swinging brake lever, a brake pad at one end of said lever, a cam face at the other end of said lever, a spring for normally holding the brake pad in engagement with said turntable, a two-armed horizontally swinging tripping lever, one arm of which lever carries a pin which bears against and rides on  
100 the cam face on the brake lever for the purpose of removing the brake pad from the turntable, and for releasing the brake pad to move into engagement with the turntable.

11. An automatic brake for gramophones  
105 and similar talking machines comprising in combination a turntable, a movable sound box arm, a horizontally swinging brake lever, a brake pad at one end of said lever, a cam face at the other end of said lever,  
110 a spring for normally holding the brake pad in engagement with said turntable, and a two-armed horizontally swinging tripping lever one arm of which lever carries a pin which bears against and rides on the cam  
115 face on the brake lever for the purpose of removing the pad from the turntable while the second arm of the tripping lever is formed so as to be tripped by said sound box arm when the sound box arm ap-  
120 proaches the end of its operative path for the purpose of bringing the brake pad into engagement with the turntable and thus stopping the machine.

12. An automatic brake for gramophones  
125 and similar talking machines comprising in combination a turntable, a movable sound reproducer, a horizontally swinging brake lever, a brake pad at one end of said lever, a spring normally holding said pad in en-  
130



gagement with said turntable, a two armed tripping lever swinging about a fixed vertical axis, means for removing the brake pad from the turntable when said reproducer is placed in the starting position, and for releasing the brake pad to move into engagement with the turntable as said reproducer approaches the end of its operative path across said turntable.

13. An automatic brake for gramophones and similar talking machines comprising in combination a turntable, a movable sound reproducer arm, a horizontally swinging brake lever, a brake pad at one end of said lever and a cam face at the other end of said lever, a spring normally holding the brake pad in engagement with said turntable, and a horizontally swinging tripping lever of which one arm, carrying a pin, lies in the path of said sound reproducer arm as it is returned to the starting position so that this movement will force the pin to bear against and ride on the cam face on the brake lever and bring the brake pad away from the turntable while a second arm on said tripping lever is formed so as to be tripped by the sound reproducer arm as said sound reproducer arm approaches the end of its operative path across said turntable for the purpose of bringing the brake pad into engagement with said turntable.

14. In a talking machine, the combination with a rotary record support, of a movable sound reproducer arm, a pin carried by said arm, means movable about a fixed axis for braking said record support, and means actuated by said pin and embracing said pin, between predetermined limits of the path of said pin, and movable about a separate fixed axis independently of said braking means and of said sound reproducing means, for controlling said braking means.

15. In a talking machine, the combination with a rotary record support, of movable sound reproducing means, and means for braking said record support and controlling means actuated by said reproducing means and movable about a fixed axis independently of said braking means and of said

sound reproducing means for maintaining said braking means in inoperative position.

16. In a talking machine, the combination with a rotary record support, of movable sound reproducing means, comprising a projection, braking means operative to stop said support, and brake controlling means embracing said projection and operative to be shifted by engagement therewith to actuate said braking means, said brake controlling means being shifted to render said brake operative by the movement of said reproducing means in one direction and arranged to render said braking means inoperative by a movement in either direction.

17. In a talking machine, the combination with a turn-table, of a pivoted swinging arm carrying sound reproducing means, a brake lever pivoted upon a fixed axis, means tending to shift said lever into engagement with said turn-table, and a separate brake controlling lever pivoted upon a separate fixed axis and actuated by the movement of said swinging arm to release, or to retract said brake lever, or to retain said brake lever inoperative independent of the position of said arm.

18. In a talking machine, the combination with a turn-table, of movable sound reproducing means, braking means operative to stop said turn-table, and controlling means movable independently of said reproducing means and said braking means, and actuated by the movement of said sound reproducing means either inwardly or outwardly with respect to said turn-table adjacent to the starting point of said sound reproducing means for rendering said braking means inoperative, said controlling means being retained in either its operative or inoperative positions independently of said reproducing means.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THEODORE BIRNBAUM.

Witnesses:

RIPLEY WILSON,  
GEORGE TAPPING.

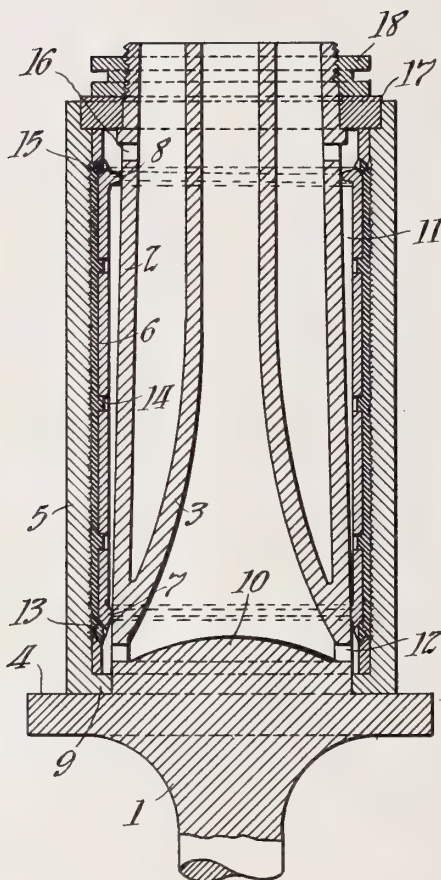




F. L. DYER.  
PROCESS FOR MAKING SOUND RECORDS.  
APPLICATION FILED JUNE 5, 1909.

1,021,973.

Patented Apr. 2, 1912.



*Witnesses:*  
Frank D. Lewis  
Dyer Smith

*Inventor:*  
Frank L. Dyer

# UNITED STATES PATENT OFFICE.

FRANK L. DYER, OF MONTCLAIR, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PROCESS FOR MAKING SOUND-RECORDS.

1,021,973.

Specification of Letters Patent.

Patented Apr. 2, 1912.

Application filed June 5, 1909. Serial No. 500,414.

*To all whom it may concern:*

Be it known that I, FRANK L. DYER, a citizen of the United States, residing at Montclair, in the county of Essex and State of New Jersey, have invented a certain new and useful Process for Making Sound-Records, of which the following is a description.

My invention relates to phonograph records and more particularly to processes for manufacturing the same, and my object is to provide an inexpensive and efficient form of record in a novel and efficient manner.

My invention is an improvement on the invention disclosed in an application of Jonas W. Aylsworth, filed June 5, 1909, Serial Number 500,415, entitled "Phonograph records and methods of making the same," my invention differing in certain details from that of said Aylsworth.

My improvement is particularly directed to the provision of a secure connection between the outer or record film and the inner or backing cylinder.

Other objects will be evident from the following specification and appended claim.

Attention is hereby directed to the accompanying drawing, forming part of this specification and representing a vertical longitudinal section through a form of apparatus in which my improved process may be carried out, a record being shown in position therein.

Referring to the drawing, the spindle 1, which is preferably mounted in a vertical position, may be rotated in any desired manner, as by a direct connected or belt connected prime mover. The tube 2, is mounted co-axially with the spindle 1, and preferably is integrally formed therewith. Also, preferably a pouring tube 3, which may be formed integral with the tube 2, or otherwise fixed thereto, is provided within the said tube 2. This pouring tube 3 is of greatly reduced diameter, so that centrifugal action within it may not be sufficient to overcome gravity of the record material poured therein, and thereby cause the production of a record film on the bore of the said tube. The spindle 1 is provided with a horizontal surface 4 on which the cylindrical record mold 5 may be seated. The tube 6, which may be formed of wood pulp, or other inexpensive substance suitable for forming a backing for a record cylinder, is

mounted in position upon a tube 2, before the mold 5 is placed in position. The outer surface of the tube 2 is preferably tapered and the wood pulp tube 6 is cylindrical, but is, however, provided with a plurality of annular ribs, as 7 and 8, on its bore, these ribs being of such diameters as to fit snugly upon the tube 2, when the wood pulp tube 6 is properly positioned thereupon. The ribs 7 thus form bearing surfaces by which the record when formed, may be mounted upon the usual taper phonograph mandrel.

The mold 5, may be provided at its lower end with an inwardly directed annular flange 9, which closely fits about the boss 10 of the spindle 1, the said boss being equal in diameter to the tube 2 at the lower end thereof. An annular tapering space or chamber 11 remains between the outer tapering surface of the tube 2 and the inner cylindrical bore of the mold 5. A plurality of passages 12 are provided through the tube 2 immediately above the bottom of the said tube and below the point at which the pouring tube 3 is fixed to the bore of the tube 2. The inner tube 6 of the record is also provided with a plurality of passages 13, extending therethrough, by which the record material introduced into the pouring tube 3 and passing thence through passages 12 into chamber 11, may pass through the inner tube 6 into the annular space between the outer circumference thereof and the bore of the mold 5. The inner tube 6 is also provided with a plurality of recesses in the outer circumference thereof, or passages therethrough as 14, in which the record material flows to some extent during the formation of the record, to firmly bind the inner and outer layers of the record together. The inner tube 6 is also provided near its upper end with passages 15 extending therethrough, and the tube 2 is provided with passages 16 therethrough, adjacent said passages 15.

When the parts are assembled with the mold 5 mounted in position on the horizontal surface 4 of the spindle, the parts may be clamped together by any suitable means. I have shown a ring 17, mounted in position on the top of the mold 5, the said ring resting upon a shoulder, formed on the outer surface of the tube 2, and against a shoulder formed on the upper portion of

the mold 5. This ring may be securely held in position by a clamping ring 18 which is screw-threaded on the upper end of the tube 2 into contact with the upper surface of ring 17.

In operation, spindle 1 is rotated at very high speed, and the molten or fluid record material poured into the tube 3. This material passes through passages 12 and 13, and rises under centrifugal action to fill all the space between the outer surface of tube 6 and the bore of mold 5, air being driven ahead of the rising column of record material through passages 15, and through openings 14, if these extend completely through the inner tube 6. The amount of material introduced into pouring tube 3 is limited and is just sufficient to fill the space designed therefor, with small amounts of the record material projecting into the passages 13, 14 and 15, in the inner tube 6. When the outer layer has been sufficiently hardened in any desired manner, the composite

record comprising the inner and outer tubes joined together, may be extracted from the mold in any desired manner.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is as follows:—

The process of forming cylindrical sound records, consisting in causing a thin layer of suitable fluid record material to form centrifugally within a cylindrical mold and around a backing of cheaper material, and to join firmly to the latter by flowing into recesses therein, hardening the record material, and removing the complete composite record from the mold, substantially as described.

This specification signed and witnessed this 4th day of June 1909.

FRANK L. DYER.

Witnesses:

DYER SMITH,  
JOHN M. CANFIELD.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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T. H. MACDONALD.  
RE-PRESSING DISK SOUND RECORDS.  
APPLICATION FILED SEPT. 8, 1906.

1,022,100.

Patented Apr. 2, 1912.

Foundation (old disc record) composed  
in part of inferior record material.

Apply to face of record a quantity  
of shellac-containing material.

Subject coated record to heat.

Apply a quantity of inferior record  
material to the back of record.

Press record of sound in surface of  
shellac-containing material in  
heated mold.

Inventor

*Thomas H. Macdonald.*

Witnesses  
*James H. Anderson*  
*E. E. Warfield*

By  
*Lawrence Cameron, Lewis & Harrison*  
Attorneys

# UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO AMERICAN GRAPHOPHONE COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF WEST VIRGINIA.

## RE-PRESSING DISK SOUND-RECORDS.

1,022,100.

Specification of Letters Patent.

Patented Apr. 2, 1912.

Application filed September 8, 1906. Serial No. 333,813.

*To all whom it may concern:*

Be it known that I, THOMAS H. MACDONALD, a citizen of the United States, and a resident of Bridgeport, Connecticut, have invented a new and useful Improvement in Re-Pressing Disk Sound-Records, which improvement is fully set forth in the following specification.

This invention relates to disk sound-records and has for its object to utilize old disk records.

In the manufacture of disk records by the American Graphophone Company, with whom I am now operating, two materials are employed known respectively as ingredient No. 1 and ingredient No. 2. These ingredients consist of the ordinary material or stock employed in making such articles, namely, earthy matter and a binder consisting of a gum or gums. What we call ingredient No. 1 contains a considerable amount of shellac, which is desirable for giving the proper surface to the sound-record; whereas ingredient No. 2 contains little or no shellac, but has the equivalent therefor in the form of a cheaper gum or gums as the binder. Ingredient No. 2 is employed for the main body of the disk, and ingredient No. 1 constitutes the surface.

In carrying out my invention, I proceed as follows: The old record disk is placed with the record-surface, which usually contains a printed label, uppermost, and is covered with finely powdered ingredient No. 1. In practice,  $\frac{1}{2}$  ounce or  $\frac{3}{4}$  of an ounce is sufficient to coat a ten inch record. The coated record is then subjected to heat until it has become pliable, when it is subjected to compression against the desired record-matrix. In practice, I have found it desirable in heating the dusted record, to place it upon a piece of muslin or canvas about twelve inches square for a ten inch record, and lay on a steam table. A cover may be used for the record, if necessary, to confine the heat so as to expedite the process. When the old record has become pliable, the powder (ingredient No. 1) will have become adhesive, and the whole is then lifted by the muslin or canvas and placed face downward upon the matrix. The cloth is then removed by peeling it from the softened disk, and a small quantity of ingredient No. 2 (about one-fourth of the amount used in making a complete record *de novo*, or say about  $\frac{1}{2}$

ounces for a ten inch record) is placed upon top of the old material, and the back of the die (preferably a little hotter than usual) is put in place and then pressure applied in the usual manner. The excess of stock will be squeezed out leaving the finished article of the usual dimensions. There is no "flowing" of the material over the face of the matrix, consequently the matrix-surface will not be injured.

The article just prepared is, so far as sound-record qualities are concerned, equally as good as any other superior record; and in physical respects it is less liable to break or warp, and, because of the presence of more hard material on its surface, it will withstand more reproductions than heretofore believed possible.

Changes in the detail of procedure may be made without departing from the spirit of my invention.

The diagrammatic drawing annexed hereto for convenient reference indicates the successive steps in my process, as practiced. I have set forth these steps with some particularity, but the invention is not limited to the precise forms and details disclosed: nor is this drawing to be understood as indicating the scope of the invention, reference being had to the appended claims for this purpose.

Having thus described my invention, I claim:

1. The process of utilizing or repressing old disk records, which consists of covering the surface thereof with suitable material in powdered form, applying heat, placing additional material at the back, and compressing the same against a record-matrix.

2. The process of utilizing or repressing old disk records, which consists of applying suitable materials at the front and back thereof respectively, and subjecting the same to heat and pressure against a record-matrix.

3. The process of pressing a sound-record, which consists in taking a tablet composed of inferior material capable of being rendered plastic by heat, and having one surface or side composed of superior shellac-containing material, applying to said shellac-containing surface a layer of powdered shellac-containing record material, heating the said tablet and said powdered layer until they become plastic, applying a sound-record

matrix to said heated powdered layer, and subjecting the whole to pressure.

4. The process of pressing a sound-record, which consists in taking a tablet composed in part of an inferior material capable of being rendered plastic by heat, and having a superior record surface containing shellac, applying to said superior record surface a layer of superior shellac-containing record material also capable of being rendered plastic by heat, subjecting the whole to heat, applying a sound-record matrix against said last-named layer, and subjecting the whole to pressure.

5. The process of pressing a sound-record, which consists in taking a tablet composed in part of an inferior material capable of being rendered plastic by heat and having a shellac-containing surface of superior material, applying in powdered form a shellac-containing material to said superior surface, subjecting the whole to heat until the said layers become united and plastic, placing a body rendered plastic by heat to the back of said inferior layer, applying a sound-record matrix to said powdered shellac-containing surface, and subjecting the whole to pressure.

6. The process of pressing a sound-record, which consists in taking a tablet composed in part of an inferior material capable of being rendered plastic by heat and having a shellac-containing surface of superior material, applying a shellac-containing material to said superior surface, subjecting the whole to heat until the said layers become united and plastic, placing a body rendered plastic by heat to the back of said inferior layer, applying a sound-record matrix to said shellac-containing surface, and subjecting the whole to pressure.

7. The process of pressing a sound-record, which consists in taking a tablet composed in part of inferior material capable of being rendered plastic by heat and having a superior shellac-containing surface, applying to said shellac-containing surface a layer of shellac-containing material capable of being rendered plastic by heat, subjecting the

whole to heat, applying a sound-record matrix to said shellac-containing surface and also applying to the back of said first-named inferior layer a second layer of inferior material rendered plastic by heat, and subjecting the whole to pressure.

8. The process of pressing a sound-record, which consists in taking a tablet composed in part of inferior material capable of being rendered plastic by heat and having a surface of superior shellac-containing material also capable of being rendered plastic by heat, applying a shellac-containing body of plastic material to the face of said superior shellac-containing layer, subjecting the whole to heat, applying to the back of said inferior layer a body of inferior material rendered plastic by heat, placing said shellac-containing body in contact with a sound-record matrix, and subjecting the whole to pressure.

9. The herein described method of making molded articles, which consists in applying to the upper surface of a foundation which becomes plastic under the influence of heat, a layer of powdered material having like properties, exposing both the foundation and the applied powdered layer to heat to cause them to unite, and thereupon transferring the entire article to a mold and subjecting it to pressure therein while hot.

10. The herein described method of molding sound-records, which consists in applying to the upper surface of a foundation which becomes plastic under the influence of heat, a layer of powdered shellac-containing material which also becomes plastic under the influence of heat, exposing both the foundation and the applied powdered layer to heat, and then subjecting the whole to pressure while hot and with said powdered layer in contact with a sound-record matrix.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

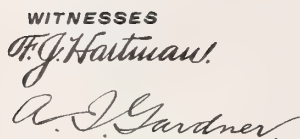
Witnesses:

A. B. KEOUGH,  
R. T. PITT.





Patented Apr. 2, 1912.



BY

**ATTORNEY**

# UNITED STATES PATENT OFFICE.

WILBURN N. DENNISON, OF MERCHANTVILLE, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

## TALKING-MACHINE.

1,022,126.

Specification of Letters Patent.

Patented Apr. 2, 1912.

Application filed August 27, 1910. Serial No. 579,200.

*To all whom it may concern:*

Be it known that I, WILBURN N. DENNISON, a citizen of the United States, and a resident of the borough of Merchantville, county of Camden, and State of New Jersey, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, clear, and complete disclosure, reference being had to the accompanying drawings.

The main objects of this invention are, to provide in a talking machine a simple and effective joint between a hollow tone arm and a hollow support; to provide an improved joint between a tone arm and a hollow support by which the tone arm will be held yieldingly in position to permit of the free movement thereof, and to avoid rattling; to provide an improved joint between a tone arm and its support in which the tone arm will be readily detachable; and to provide other improvements as will appear hereinafter.

In the accompanying drawings, Figure 1 is a side elevation, partly in vertical central section, of one embodiment of this invention; Fig. 2 a fragmentary horizontal section of the same; and Fig. 3 a rear elevation, partly in vertical section of the same.

Referring to the drawings, one embodiment of this invention comprises a hollow bracket or support 1, normally vertically arranged and adapted to be secured at its lower end to the usual motor casing of a talking machine. This bracket 1 is adapted to support at its upper end a hollow tone arm 2, with which it communicates, the tone arm 2 being adapted to support at its free end 3 the usual or any suitable sound recorder or reproducer communicating therewith and adapted to cooperate with a rotary record support 4. The interior of the hollow bracket forms a sound conduit 9, and the upper end 10 of the hollow bracket is open and preferably cylindrical in shape, and is preferably provided with an annular recess 11, in which is snugly fitted a cylindrical bushing 12, the inner surface of which is preferably flush with the inner surface of the bracket. The upper end wall 13 of this bushing is preferably concave and in the form of a spherical zone, the center of curvature 14 of which is above the cylindrical upper end of the bracket and coincident with the longitudinal axis thereof.

The inner portion 20 of the tone arm 2 is curved downwardly through an arc of 90 degrees and terminates in a downwardly extending open cylindrical end, which is snugly surrounded by a collar 21 fixed thereon by a screw 22 or other suitable means. This collar 21 is preferably provided at its lower end with an inwardly extending annular flange 23, which overlaps and abuts against the lower end wall of the tone arm, and the inner surface of this flange is preferably flush with the inner surface of the tone arm. This collar 21 is preferably of the same outside and inside diameters as the bushing 12 of the bracket 1, and the lower end wall of the collar and its flange is preferably in the form of a convex spherical zone, conforming in shape to the concave spherical end of the bushing 12. A pin or stop projects outwardly from the collar 21, rigid therewith, and is spaced slightly above the upper end of the support 1 when the tone arm is in operative position. This stop 24 is adapted to engage against the upper end of the support 1 to limit the downward movement of the tone arm when the arm is swung away from the record and is in inoperative position.

For rotatively connecting the tone arm 2 to the bracket 1, the bushing 12 at the upper end of the bracket is provided with a bridge 25, integral or otherwise rigid therewith, and extending diametrically thereof. This bridge 25 is provided with a cylindrical aperture 26, coaxial with the bushing 12 and adapted to form a bearing for the lower portion of a cylindrical pivot 27, which projects snugly but slidably therethrough. The upper end of this pivot 27 is preferably reduced in diameter, as at 28, and this reduced portion fits tightly through a corresponding aperture in the central portion of a transverse or horizontally extending, elongated cross-head 29, and is riveted or otherwise secured in place and preferably rigid therewith. One end of the cross-head 29 is reduced in diameter to form a trunnion 30 coaxial therewith, and the other end of the head is provided axially with a screw 31 threaded therein and forming a trunnion corresponding in size to the trunnion at the other end of the head. These trunnions are in horizontal alinement and fit rotatively in corresponding apertures in the opposite walls of the tone arm 2, re-



spectively, whereby the tone arm is mounted to oscillate about the trunnions as an axis, the tone arm being held against movement longitudinally of the trunnions by the ends of the central portion of the cross-head. The longitudinal axis of the trunnions 30 and 31 intersects the longitudinal axis of the vertical pivot 27 at the center of curvature of the spherical surfaces of the bushing 12 in the upper end of the bracket and the collar 21 of the lower end of the tone arm, whereby as the tone arm is oscillated, either about its horizontal axis through the trunnions or about its vertical axis through the pivot, these spherical surfaces will remain in sliding contact.

For holding the tone arm yieldingly in position, the lower portion of the pivot 27 which projects beneath the bridge 25 is surrounded by a spiral spring, or other yielding means, 35, which is normally slightly compressed between the lower surface of the bridge 25 and the upper surface of a washer 36, which surrounds the pivot 27 below the spring, and which is held against downward movement with respect to the pivot by a pin 37, extending through the pivot below the washer or by other suitable means.

For minimizing the interruption of sound waves passing through the tone arm and bracket by the pivotal connection between the tone arm and bracket, the bridge 25 of the bushing 12 is preferably arranged in a vertical plane substantially perpendicular to the vertical plane through the longitudinal axis of the tone arm, when the tone arm is in intermediate operative position, or, in other words, a position substantially midway between its initial operative position and its final operative position in reproducing sounds from a record, and the elongated cross-head 29 is preferably arranged horizontally, as hereinbefore stated, in a vertical plane perpendicular to the vertical plane through the longitudinal axis of the tone arm 2. By this arrangement the cross-head 29 is at all times, during the operation of the machine, either approximately, or exactly, in alinement with the bridge 25, and the interruption of the sound waves is therefore minimized. To insure the proper position of the bushing 12, to secure this result, a pin or stop 40 is fixed in the upper end of the bracket 1 and projects inwardly and engages a corresponding slot 41 opening in the lower edge of the bushing 12.

In this construction it is evident that the pivotal connection between the tone arm and its bracket or support is located in the sound conduit formed by the tone arm and its hollow support, and is substantially entirely inclosed by the tone arm and support, in the sound conduit formed thereby; that the tone arm may be removed from its support-

ing cross-head 29 by removing the screw or removable trunnion 31; and that the bushing 12 and pivot 27 are readily removable from the bracket 1.

The yielding pressure exerted by the spring 35 to hold the parts of this device together is preferably only sufficient for this purpose, leaving the tone arm 2 practically free to rotate about the longitudinal axis of the pivot and also about the horizontal axis of the cross-head 29. The pressure of the spring 35, however, is sufficient to prevent any rattling between the relatively movable parts of the joint and to maintain a close fitting connection between the tone arm and the bracket, whereby there will be no leakage of sound waves, and the joint will have a high degree of efficiency.

Although only a single form has been described in which this invention may be embodied, it is obvious that the invention might be applied in other constructions than the one described, and that various changes might be made in the details of construction without departing from the spirit of this invention or the scope of the appended claims.

Having thus fully described this invention, I claim and desire to protect by Letters Patent of the United States:

1. The combination with a hollow support having an open end, of a tone arm having an open end communicating with the open end of said support, a pivot connected to said tone arm, a bushing in the open end of said support, a bearing carried by said bushing in which said pivot is rotatively supported and normally longitudinally movable, and yielding means surrounding said pivot and coöperating with said bearing for holding said tone arm in place.

2. The combination with a hollow support having an open end, of a tone arm having an open end communicating with the open end of said support, a bushing in the open end of said support, pivot means between said tone arm and said bushing for holding said tone arm movably in position, a collar fixed around the open end of said tone arm and having a lower end wall substantially in the form of a spherical zone, the upper end wall of said bushing being shaped to conform to the lower end wall of said collar, and yielding means surrounding said pivot means and coöperating with said bushing for holding said end walls in sliding contact with each other.

3. The combination with a bracket constituting a sound conveying tube throughout its entire extent, of a washer snugly fitted within one end and having a concave outer end wall, a bridge within said washer and in rigid engagement therewith, a tone arm having an open end in alinement with the open end of said bracket, a sleeve snugly fitted around the open end portion of said tone

arm and having a convex outer end wall, said washer and sleeve being in alinement and slidable contact with each other, a cross-head within said tone arm and in pivotal engagement therewith, a pivot-pin rigid with said cross-head and in slidable engagement with said bridge, and resilient means surrounding said pivot for yieldingly maintaining said sleeve and washer in frictional contact with each other.

4. The combination with a bracket constituting a sound conveying tube throughout its entire extent, of a washer snugly fitted within one end and having a concave outer end wall, a bridge within said washer and in rigid engagement therewith, a tone arm having an open end in alinement with the open end of said bracket, a sleeve snugly fitted around the open end portion of said tone arm and having a convex outer end wall, said washer and sleeve being in alinement and slidable contact with each other, a cross-head within said tone arm and in pivotal engagement therewith, and a pivot-pin rigid

with said cross-head and in slidable engagement with said bridge. 25

5. The combination with a bracket constituting a sound conveying tube throughout its entire extent, of a washer snugly fitted within one end, a bridge within said washer and in rigid engagement therewith, a tone arm having an open end in alinement with the open end of said bracket, a sleeve snugly fitted around the open end portion of said tone arm, said washer and sleeve being in alinement and slidable contact with each other, a cross-head within said tone arm and in pivotal engagement therewith, and a pivot-pin rigid with said cross-head and in slidable engagement with said bridge. 30 35 40

In witness whereof, I have hereunto set my hand this 24th day of August A. D., 1910.

WILBURN N. DENNISON.

Witnesses:

DEAN S. RENWICK,  
CHARLES T. WILLARD.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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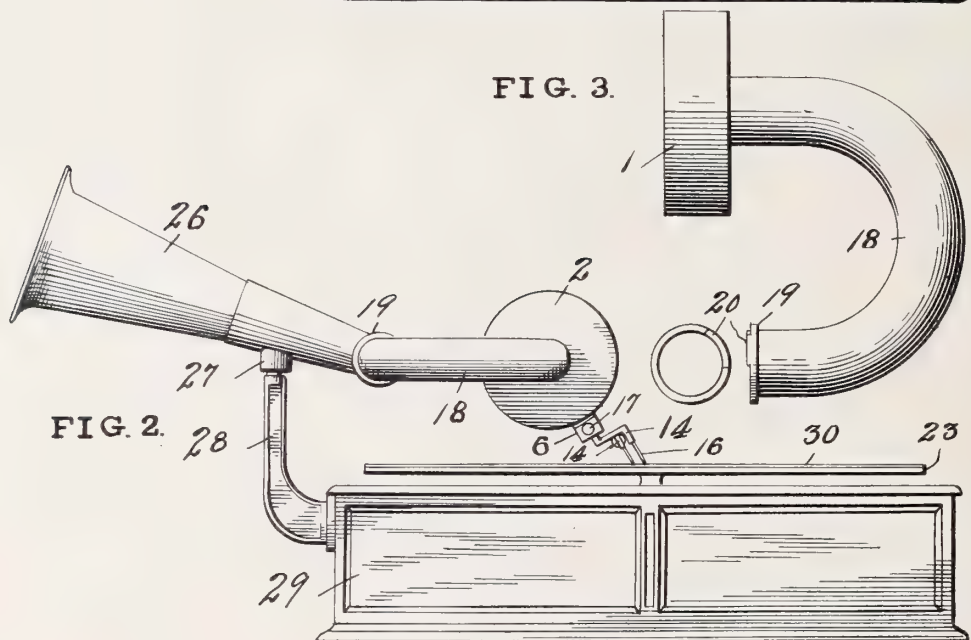
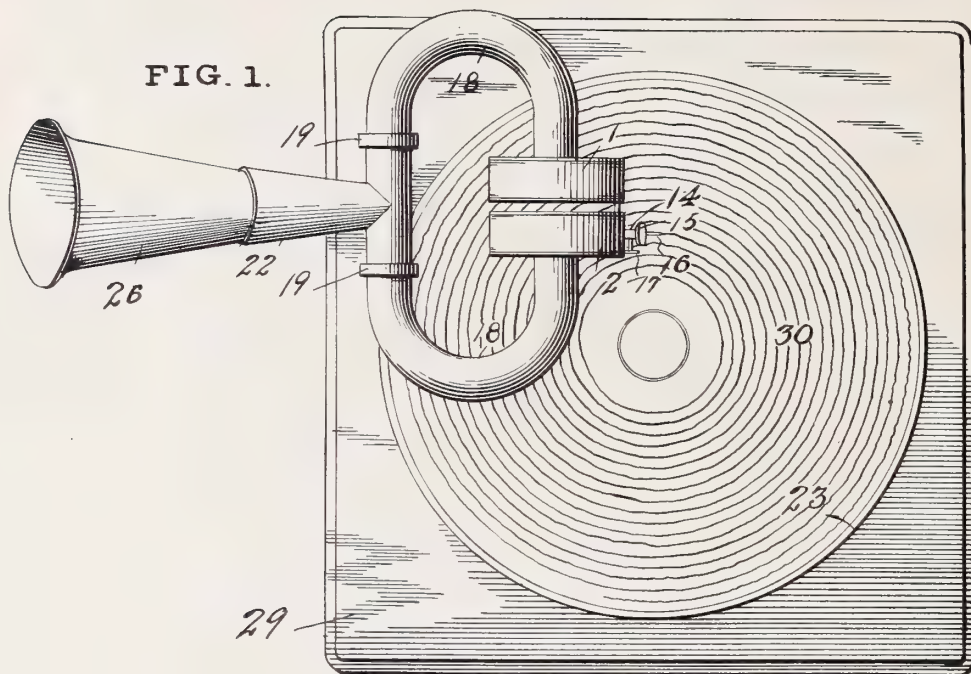


1,022,180.

J. B. BROWNING.  
TALKING MACHINE.  
APPLICATION FILED DEC. 22, 1903.

Patented Apr. 2, 1912.

2 SHEETS—SHEET 1.



Witnesses  
M. E. Moore  
J. B. Browning

Inventor  
John B. Browning  
by Frank R. Boone  
Attorney





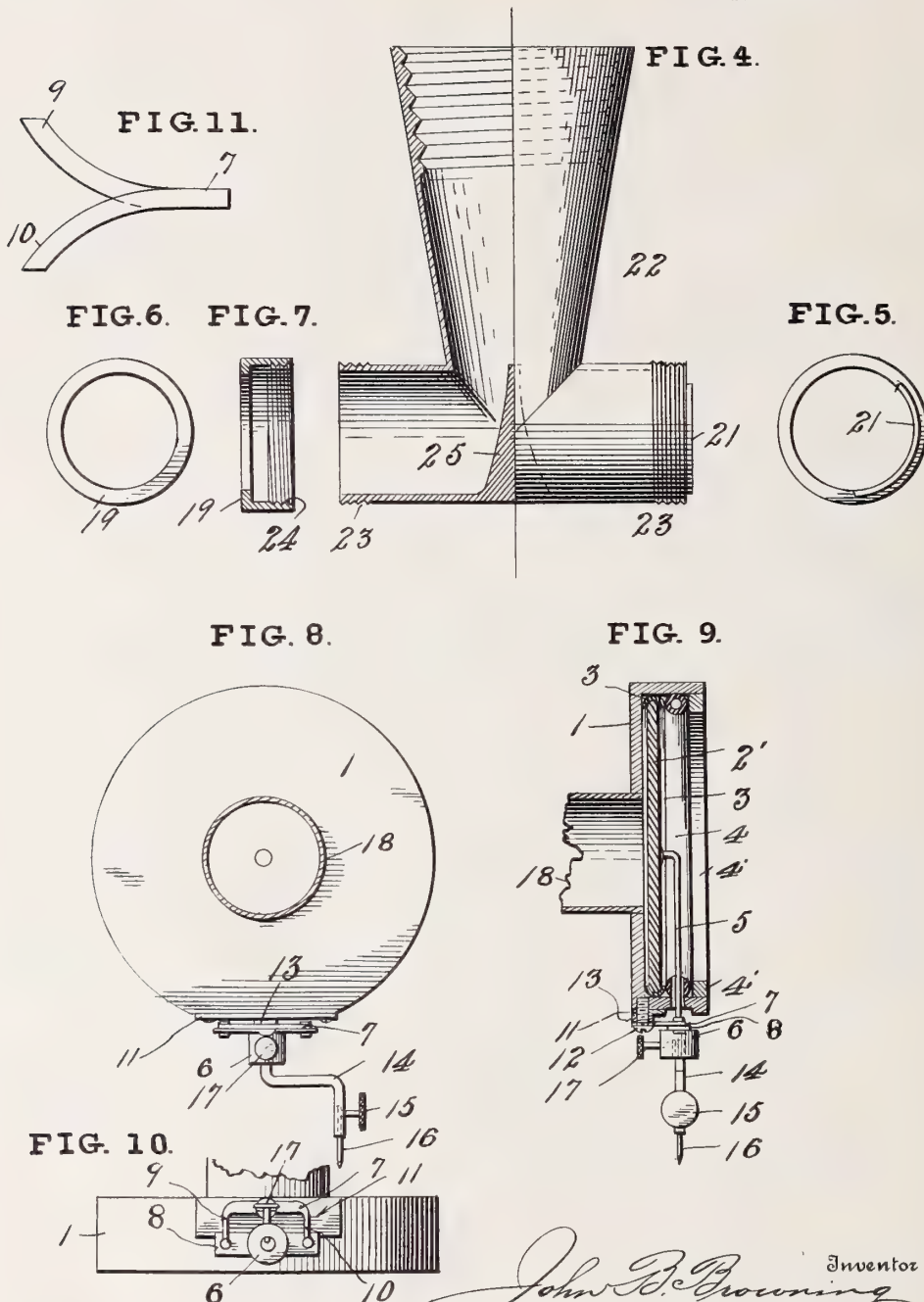
J. B. BROWNING.  
TALKING MACHINE.

APPLICATION FILED DEC. 22, 1903.

1,022,180.

Patented Apr. 2, 1912.

2 SHEETS—SHEET 2.



Witnesses

Chas. K. Davis.

*(Signature)*

*John B. Browning* Inventor  
*Frank R. Bowne* By

Attorney

# UNITED STATES PATENT OFFICE.

JOHN B. BROWNING, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, OF CAMDEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## TALKING-MACHINE.

1,022,180.

Specification of Letters Patent.

Patented Apr. 2, 1912.

Application filed December 22, 1903. Serial No. 186,197.

*To all whom it may concern:*

Be it known that I, JOHN B. BROWNING, a citizen of the United States, and a resident of Camden, county of Camden, and State of New Jersey, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, complete, and exact disclosure, reference being had to the accompanying drawings, forming a part of this specification.

The objects of this invention are to provide in a talking machine a plurality of sound boxes arranged to reproduce either simultaneously or separately the same tones from a single record, and to arrange the said boxes so that the operator is enabled to change the volume and quality of the sound at will, by raising one box while the other continues playing; to provide means whereby a pair of independent sound boxes may be supported by a single sound tube; and to provide other improvements, as will appear hereinafter.

In the accompanying drawings, Figure 1 is a plan view of a talking machine constructed in accordance with this invention; Fig. 2 a side elevation of the same; Fig. 3 an enlarged plan and partial end view of a detail of the same; Fig. 4 an enlarged top plan view one-half in longitudinal central section of a detail of the same; Fig. 5 a side elevation of one portion of Fig. 4; Figs. 6 and 7 are a side elevation and a longitudinal central section respectively of a detail of the same; Figs. 8, 9 and 10 are a rear, a fragmentary central sectional, and a fragmentary bottom view respectively, of an improved sound box forming a part of this invention, and Fig. 11 is a diagrammatic view of a detail of the same.

Referring to the drawings, one embodiment of this invention comprises two independent sound boxes or reproducers having casings 1 and 2 respectively, each having a cylindrical bore, and containing a circular diaphragm 2' made of any suitable material, preferably mica having a transversely rounded peripheral edge. Each diaphragm is mounted in a split annular rubber tube or gasket 3, which contacts only with the rounded peripheral edge of the diaphragm and the outer surface of which is rounded transversely and contacts with the surface of the bore and the inner surface of the end of the casing and prevents the diaphragm

from contacting with any part of the casing. This split gasket also serves as a packing and as an insulator for the diaphragm and prevents the edge of the diaphragm from splitting, and engaging the rounded edge only of the diaphragm, forms a mounting which permits the diaphragm to vibrate very freely throughout its entire area.

A tubular rubber gasket 4 is inserted in each sound box casing to hold the split gasket 3 and its diaphragm 2' in position, and both gaskets are held in place by a metallic ring 4' which is inserted through the open face of the casing and fits snugly within the bore of the casing, and which may be attached to the casing in any suitable manner.

A stylus bar 5, is phonetically connected to each diaphragm 2' by any approved means and extends through openings provided therefor in the gasket 4 and in the sound box casing. The free end of the stylus bar 5 is enlarged to form a cylindrical portion 6 which is provided with an axial socket opening into the end thereof as shown and with oppositely extending rigid arms, rigid therewith, formed by the transverse plate or portion 8. To the ends of these arms are rigidly secured by rivets or otherwise, the outer ends respectively of two spring arms 9 and 10 which are connected at their opposite ends by the comparatively rigid flat portion 7 forming a U-shaped spring support for the stylus bar. The stylus bar 5 and its transverse arms or plate 8 are preferably made in one piece of metal so as to be substantially rigid to impart a positive vibratory motion to the diaphragm.

The U-shaped support for the stylus bar is preferably made of spring steel and the arms 9 and 10 are preferably deflected in opposite directions before being tempered to assume the position shown in Fig. 11 and the support is then tempered uniformly. When secured in place between the sound box casing and the rigid arms of the stylus bar, the arms 9 and 10 are held parallel, in a plane perpendicular to the diaphragm, and under balanced stresses.

For connecting the U-shaped spring support rigidly to the sound box casing, one side of the casing is flattened and is provided with a plate 11 secured thereto, upon which is mounted a washer 13, against the outer surface of which is rigidly secured the



intermediate portion 7 of the U-shaped support by means of a screw 12 which passes freely through the spring support, washer 13, and plate 11, and is threaded into the sound box casing. This construction holds the intermediate portion 7 of the spring support in fixed position but permits the free elastic motion of its arms 9 and 10. Each stylus bar is therefore free to oscillate in a plane perpendicular to its diaphragm but is held comparatively rigid against movement in any other direction.

A rotatively and longitudinally adjustable crank shaped stylus arm 14 is secured in the socket of the free end 6 of each stylus bar by a set screw 17, and the outer end of each stylus arm 14 is provided with a socket for holding a stylus 16, and with a thumb screw 15 for clamping the stylus in position. The construction is such that by adjusting the stylus arms 14 the stylus of one sound box may be arranged to track closely after the stylus of the other sound box in the same track or groove of the record so that the two boxes will reproduce practically simultaneously the same tones from the record.

For supporting the sound boxes, a metallic U-shaped tube 18 is secured at one end in the opening in the back of the casing of each sound box by a driving fit, and the other end of the tube is provided with a flange or collar 19 rigid therewith, provided with a segmental stop plate 20 concentric and rigid therewith, which interlocks with a segmental stop plate 21 concentric and rigid with one end of a hollow T coupling 22. The T coupling 22 comprises a transverse substantially cylindrical tubular portion extending between the ends of the U-shaped tubes 18, and a substantially conical tubular portion flaring centrally, rearwardly and upwardly therefrom, substantially at right angles thereto. The ends of the transverse cylindrical portion of the T are each provided with external screw threads 23 which are right and left hand respectively, and upon each end is threaded a union collar 19' having internal threads 24 and whereby the flanged ends of the U tubes are rotatably secured to the ends of the transverse portion of the T.

The T coupling 22 is provided with a circular baffle plate or deflector 25 arranged transversely of the cylindrical portion of the T and in alinement with the axial plane of the conical portion of the T substantially perpendicular to the axis of the transverse portion of the T. This deflector is preferably integral with the T and tapers in thickness toward the conical portion of the T, the sides of the deflector being slightly curved.

The purpose of the deflector 25 is to direct the sound waves, coming from the sound boxes through the U tubes 18, into the lon-

gitudinal central portion of the T and toward the horn or sound amplifier 26 which is threaded into the outer end of the conical portion of the T. The deflector therefore transmits the full phonetic effect of both sound boxes through a single channel to the amplifier without any nullifying effect of one sound box upon the other.

The T coupling 22 carrying the sound boxes and the horn 26, is rotatably supported by a vertical post 27 which is mounted to rotate upon a vertical axis in the upper end of a rigid metal arm or bracket 28 which is rigidly secured to the usual talking machine cabinet 29 by any suitable means. The cabinet 29 contains the usual motor for rotating the usual turn table 23 which is mounted upon the cabinet for carrying a record 30. By this construction the sound boxes when in operative position, are arranged close to and facing each other and substantially in axial alinement, and are free to swing in unison across the face of a record, or to be moved separately or in unison toward or away from the record. The sound boxes are also free when in operative position, to move either up or down sufficiently to conform to any unevenness in the surface of the record. When not in operative position on the record, the sound boxes are supported by means of the stop plates or projections 20 engaging with the corresponding plates 21, and either sound box may be inverted to rest in an inoperative position while the other sound box is left in operation.

Although this invention has been here shown in only one of the forms in which it may be embodied, it is obvious that many changes might be made in the construction herein set forth without departing from the spirit of the invention, or the scope of the appended claims.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a talking machine a plurality of sound reproducers connected to a common outlet, each of said sound reproducers having a vibrating arm and a needle point connected thereto by an adjustable arm, and a compensating spring attached to each sound reproducer and also to each of the vibrating arms.

2. A talking machine, comprising a T shaped sound conveyer mounted upon a vertical axis, and a sound conveyer connected with each lateral arm of the T to swing vertically and sound box mechanism connected with the free end of said latter conveyers.

3. A device of the class described comprising a record tablet, a plurality of sound conveying tubes mounted to swing about a fixed axis and in a plane parallel to said tablet, a sound box carried by each of said tubes and engaging said record tablet, and a

hollow sound collecting member connecting said tubes.

4. In a talking machine, the combination with a pivoted swinging sound conveying arm provided with a sound conduit, of a plurality of separately movable sound boxes carried thereby and communicating with said conduit.

5. A talking machine comprising a pivoted movable arm provided with a sound conduit and a plurality of sound boxes carried by said arm and communicating with said conduit, each sound box being provided with an independent stylus bar.

6. In a talking machine, the combination with a pivoted swinging sound conveying arm provided with a sound conduit, of separately movable sound boxes carried thereby and communicating with said conduit, each sound box being provided with an independent stylus bar.

7. In a talking machine, a record support, a sound arm mounted to rotate about a single axis and provided with a sound conduit, a plurality of sound boxes carried by said arm and communicating with said conduit, means for supporting a stylus carried by each of said boxes, each of said boxes being movable with respect to said arm and away from said support a sufficient distance to permit of the removal or insertion of a stylus.

8. In a talking machine, the combination with a flat disk record having an undulatory line thereon corresponding to a sound wave, of a plurality of sound boxes mounted to swing about an axis perpendicular to said disk provided with separate stylus needles arranged to engage simultaneously said line.

9. In a talking machine, the combination with a sound tube, of a pair of oppositely disposed lateral tubular U-shaped extensions carried thereby and movable with respect thereto, and a sound box carried by each of said extensions.

10. In a talking machine, the combination with a swinging sound tube, of a pair of oppositely disposed lateral tubular U-shaped extensions carried thereby and movable with respect thereto, and a sound box carried by each of said extensions.

11. In a talking machine, the combination with a sound tube, of a pair of oppositely disposed inwardly facing sound boxes carried thereby and communicating therewith, each of said boxes being provided with a separate stylus bar.

12. In a talking machine, the combination with a sound tube, of a pair of oppositely disposed inwardly facing sound boxes carried thereby and communicating therewith and movable independently of each other thereon.

13. In a talking machine, the combination with a sound tube, of a pair of oppositely

disposed sound boxes carried thereby and communicating therewith, each of said boxes being provided with a separate stylus bar, and one of said bars being provided with a laterally extending needle holding arm.

14. In a talking machine, the combination with a tubular sound conveyer, of a pair of oppositely disposed tubular extensions carried thereby and movable with respect thereto, and a sound box carried by each of said extensions.

15. In a talking machine, the combination with a plurality of sound reproducers communicating with a common outlet, of a stylus bar mounted to oscillate on each reproducer and an arm adjustably connected to each stylus bar for holding a stylus.

16. In a talking machine the combination with a sound record, of a plurality of sound boxes engaging said record and sound conveying means mounted to swing about a fixed axis and connecting said sound boxes.

17. In a talking machine, the combination with a hollow movable member mounted to swing upon a fixed axis, of a plurality of sound boxes carried thereby and communicating therewith.

18. In a talking machine, the combination with a hollow movable member, of a plurality of sound boxes carried thereby and communicating therewith and movable independently thereof.

19. In a talking machine, the combination with a member rotatably mounted upon a vertical axis, of a plurality of sound boxes carried thereby.

20. In a talking machine, the combination with a horizontal rotary record support, of a sound conveyer mounted to swing upon a vertical axis over said support and having a sound conducting passage, and a plurality of sound boxes carried by said conveyer, movable with respect thereto, and communicating with said passage.

21. In a talking machine, the combination with a member rotatably mounted upon a vertical axis, of a plurality of sound boxes carried thereby, each of said sound boxes being independently movable, upon a substantially horizontal axis.

22. In a talking machine, the combination with a plurality of sound boxes, each provided with a separate stylus, of means for the separate adjustment of each of said styluses laterally to hold the same in alignment.

23. In a talking machine, the combination with a sound record, of a plurality of styluses mounted to swing about a common axis to engage said record and free to be vibrated and propelled by the same to reproduce practically simultaneously the same sounds.

24. In a talking machine, the combination with a single flat disk sound record, of a



plurality of reproducers mounted to swing about an axis perpendicular to said disk and separately actuated by said record to reproduce practically simultaneously the same  
5 sounds.

25. In a talking machine, the combination with a tubular sound conveyer, of a sound box carried thereby and movable with respect thereto, and means between the sound  
10 box and the conveyer for limiting the extent of movement of the sound box.

26. In a talking machine, the combination with a tubular sound conveyer having a tubular end portion extending laterally  
15 therefrom, of a tubular section connected to the end of said transverse portion and movable with respect thereto, a sound box carried by said tubular section, and means between said transverse portion and said tubular  
20 section for limiting the movement of said tubular section.

27. In a talking machine, the combination with a support, of a section carried by said support and movable with respect thereto,  
25 a sound box carried by said section, and means between said section and said support for limiting the movement of said section.

28. In a talking machine, the combination with a tubular support, of a tubular member movable with respect thereto, a union collar between one end of said support and  
30 said member for connecting the same, and a sound box carried by said movable member.

29. In a talking machine, the combination with a tubular support having one end externally threaded, of a movable tubular member having one end provided with an external flange, a union collar threaded upon  
35 the threaded end of said support and engaging over said flange to connect said movable member to said support, and a sound box carried by said movable member.

30. In a talking machine, the combination with a tubular support, of a movable tubular member having one end communicating with one end of said support, a stop upon  
40 said end of said support, a stop upon said end of said movable member adapted to engage said first mentioned stop to limit the movement of said movable member, and a  
45 sound box carried by said movable member.

31. In a talking machine, the combination with a support, of a member movably connected to said support, a sound box carried  
55 by said movable member and invertible with respect to said support, and means between said movable member and said support for holding said sound box in its inverted position.  
60

32. The combination with a rotatably mounted hollow coupling having a longitudinal portion and a transverse end portion, of sound amplifying means carried by and communicating with said longitudinal  
65 portion, and a sound box connected to and communicating with each end of said transverse portion.

33. The combination with a hollow coupling having a longitudinal portion and a transverse end portion, of a sound amplifier carried by one end of said longitudinal portion and communicating therewith, a laterally extending tube carried by each end of  
70 said transverse portion and movable with respect thereto, and a sound box carried by each of said tubes.

34. In a talking machine, the combination with a record support, of a rotatably mounted tubular support, and a plurality of sound  
80 boxes connected to and communicating with said tubular support and movable independently toward and away from said record support.

35. In a talking machine, the combination with a support, of a member carried by and movable with respect to said support, a sound box carried by said movable member and movable with respect thereto, and means carried by said movable member for holding  
85 said sound box in an inoperative position.

36. In a talking machine, the combination with a support, of a member movably carried by said support, a sound box carried by said movable member and invertible with  
90 respect to said support, and means to hold said sound box in its inverted position.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN B. BROWNING.

Witnesses:

E. H. MUNDAY,  
M. G. COOMBS.



B. TENDLER.  
NEEDLE FOR SOUND REPRODUCING MACHINES.  
APPLICATION FILED SEPT. 20, 1911.

1,022,515.

Patented Apr. 9, 1912.

Fig. 1.

Fig. 5.

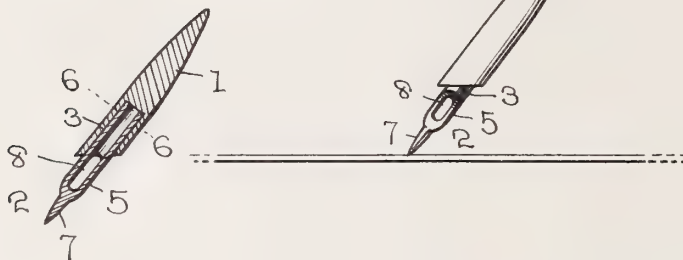


Fig. 6.



Fig. 2.

Fig. 3.

Fig. 4.

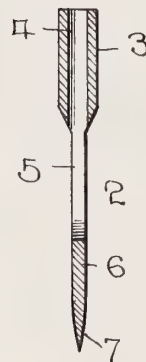
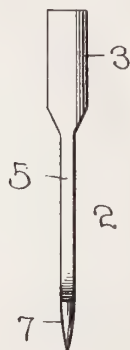
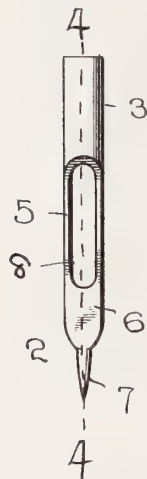


Fig. 7.



WITNESSES:

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Attorneys

# UNITED STATES PATENT OFFICE.

BENARD TENDLER, OF SCHULENBURG, TEXAS.

NEEDLE FOR SOUND-REPRODUCING MACHINES.

1,022,515.

Specification of Letters Patent.

Patented Apr. 9, 1912.

Application filed September 20, 1911. Serial No. 650,345.

*To all whom it may concern:*

Be it known that I, BENARD TENDLER, a citizen of the United States, residing at Schulenburg, in the county of Fayette and State of Texas, have invented certain new and useful Improvements in Needles for Sound-Reproducing Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in needles for sound reproducing machines, and relates more especially to needles used in connection with the gramophone type of reproducing machine.

The object of my invention is to provide a needle which will, when turned for adjustment at various positions within its socket, produce tones of any desired volume.

A further object is to provide a needle which will give a true clear toned reproduction free from objectional harsh, mechanical noises made by most of the needles now in use.

The invention will be fully understood in the following detailed description taken in connection with the accompanying drawings forming a part of this application, in which:

Figure 1 is a side elevation of a socket with one of my needles in place within; Fig. 2 is a side elevation of the needle, on an enlarged scale; Fig. 3 is an edge view of a needle on an enlarged scale; Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2; Fig. 5 is a longitudinal sectional view of the needle within the socket; Fig. 6 is a sectional view taken on the line 6—6 of Fig. 5, and, Fig. 7 is a view similar to Fig. 1 except that the needle is shown in a different position.

Referring to the drawings, there is shown a socket 1 of any desired construction in which is the needle 2, composed of a resilient and hard metal such as steel. One end of the needle is tubular in cross section and forms a hollow shank 3 having a longitudinal, central bore 4. Extending downwardly from the hollow shank 3 are the flat,

elongated resilient connecting arms 5, which are connected at their lower ends by the flat portion 6. By reference to Fig. 3 it will be seen that the thickness of the arms 5 is substantially the same as that of the flat portion 6, while as will be seen in Fig. 2, the width of the arms is considerably less than that of the flat portion. The purpose of providing the flat arms 5 is to allow flexibility of that portion of the needle when pressure is exerted against the edge thereof, while the needle will remain rigidly straight when pressure is applied to the side or flat portion 6. Centrally of the lower end of the flat portion 6 extends the tapered point 7 of the needle. The point 7 is not long tapered but is ground extremely sharp; much sharper than the usual form of needle now in use. Between the connecting arms 5 and the flat portion 6 is the elongated slot 8 which communicates with the central bore.

In operation when it is desired to reproduce a record in a loud tone, the needle is placed within the reproducer arm or socket 1 with the edge of the needle slanted to the record as in Fig. 1. Owing to the resiliency of the connecting arms 5 in this direction, the weight of the sound box and its cooperating parts will tend to bend or curve the central portion of the needle toward the record and so direct the pointed end thereof that it bears upon the sound grooves in the record at an acute angle. In this position a part of the thicker portion of the pointed end will engage the side walls of the groove and thereby cause a reproduction of a moderately loud tone.

When a reproduction is desired in a soft, clear tone the needle is placed within the socket with the flat portion 6 slanting toward the record as shown in Fig. 7. In this position the needle is held rigidly straight by the arms 5 under the weight of the sound box, and the sharp point of the needle bears directly upon the bottom of the sound groove and thereby causes a reproduction of a moderately soft tone.

What I claim is:

A gramophone needle comprising a hollow shank, a flat portion terminating in a pointed end and elongated parallel con-



necting arms between said shank and said  
flat portion, said arms being spaced to form  
an elongated slot therebetween, said slot  
communicating with the bore of said shank,  
5 said arms being capable of being bent  
laterally.

In testimony whereof I have signed my

name to this specification in the presence of  
two subscribing witnesses.

BENARD TENDLER.

Witnesses:

C. B. ERNST,

A. B. WOLTERS.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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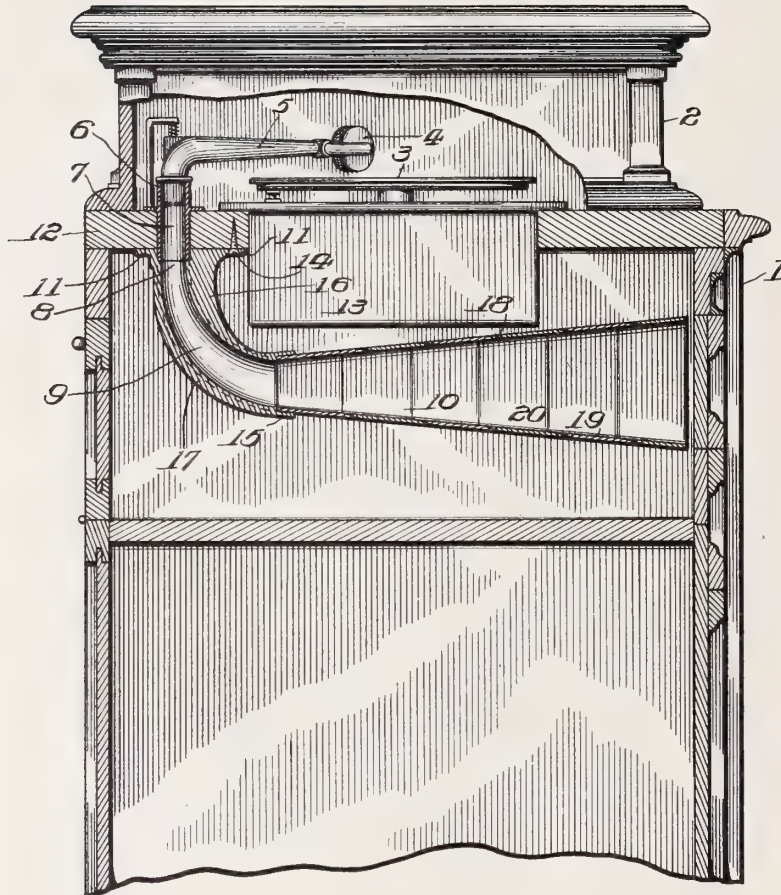
J. C. ENGLISH.  
 AMPLIFIER FOR SOUND REPRODUCING DEVICES.  
 APPLICATION FILED JAN. 15, 1910.

1,022,582.

Patented Apr. 9, 1912.

2 SHEETS—SHEET 1.

*Fig. 1.*



WITNESSES  
*R. J. Hartman*  
*Alston B. Moulton*

BY

INVENTOR  
*John C. English*  
*Harold V. L. S.*  
 ATTORNEY



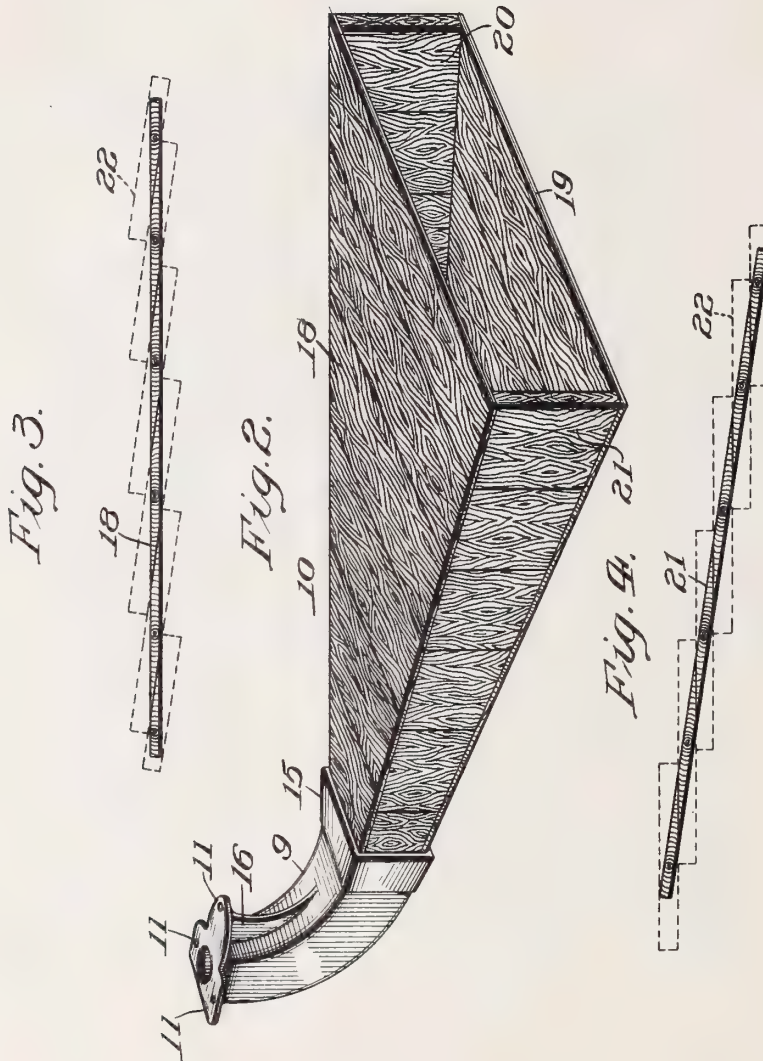


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 AMPLIFIER FOR SOUND REPRODUCING DEVICES.  
 APPLICATION FILED JAN. 15, 1910.

1,022,582.

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2 SHEETS—SHEET 2.



WITNESSES  
*F. J. Hartman*  
*Alston B. Moulton*

BY

INVENTOR  
*John C. English*  
*Harold V. Bell*

ATTORNEY

# UNITED STATES PATENT OFFICE.

JOHN C. ENGLISH, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

## AMPLIFIER FOR SOUND-REPRODUCING DEVICES.

1,022,582.

Specification of Letters Patent.

Patented Apr. 9, 1912.

Original application filed July 19, 1906, Serial No. 326,827. Divided and this application filed January 15, 1910. Serial No. 538,277.

*To all whom it may concern:*

Be it known that I, JOHN C. ENGLISH, a citizen of the United States, and a resident of Camden, State of New Jersey, have invented certain new and useful Improvements in Amplifiers for Sound-Reproducing Devices, of which the following is a full, complete, and exact disclosure.

My invention relates to sound reproducing devices and particularly to those devices which are used to augment or amplify the sounds which are being reproduced from a record of sound, the present application being a division of a prior application, Serial No. 326,827, filed July 19, 1906.

One object of my invention is to dispense with the ordinary megaphone, sound amplifying trumpet or horn which is usually used to amplify the sound reproduced by talking machines and the like and to increase the volume of the tones by means of an amplifier having sounding boards which are caused to vibrate in sympathy with the air inclosed by the same to which the sound waves are conducted from the reproducer of a sound reproducing machine.

A further object of my invention is to provide the amplifier with a portion or section whereby the vibrations are conducted from the swinging arm or conveyer and are amplified to some extent and to allow said vibrations to emerge from said portion or section between sounding boards.

A further object of my invention is to provide an amplifier with a rigid hollow portion or section which shall also act as a rigid support for the vibratory portion, whereby the vibratory portion is rigidly supported from one end only and whereby the sounding boards, by means of which the sound is further amplified, are free to vibrate substantially throughout their entire area and to vibrate in sympathy with the waves of sound conducted in proximity with the same.

A further object of my invention is to make the sounding boards or sounding sur-

faces used in connection with my sound amplifying device, resonant or capable of being readily set into vibration by sound waves.

Other objects of my invention will appear in the specification and claims below.

In the accompanying drawings forming a part of this specification in which similar parts are referred to by the same reference characters, Figure 1 illustrates a sound reproducing device or talking machine provided with my improved amplifier, the main portions of the same being shown in cross section; Fig. 2 is a perspective view of my improved sound augmenting device; Fig. 3 is a diagrammatic view of the method employed to make the sounding boards of the sound amplifying device resonant and Fig. 4 is a view similar to Fig. 3, showing the method of constructing the sides of the vibratory portion of the amplifier.

Referring to the drawings, Fig. 1, as has been above stated, illustrates a talking machine or sound reproducer provided with my improved amplifier and while the amplifier is shown therein as being used in connection with and forming a part of an inclosed talking machine, that is to say a talking machine in which all the operative parts are inclosed within a casing, my invention is not necessarily limited to use in connection with a machine of this type. In Fig. 1 the casing or talking machine cabinet is provided with a compartment 2, which contains a turntable 3, the reproducer 4 and the tapering swinging arm 5, the larger end of which is pivoted as at 6 to a hollow bushing 7 which communicates with the smaller end 8 of the rigid hollow bracket or elbow 9, the opposite end of which is adapted to support the vibratory portion or section 10.

The bracket 9 constitutes the rigid portion or section of my improved amplifier and consists of a rigid hollow structure, preferably curved longitudinally through an arc of substantially ninety degrees, the smaller end of which is provided with a plate 11



integral therewith by which the same is rigidly secured at one end by means of screws 14 or other suitable fastening devices to the thick partition 12, which separates the upper compartment 2 from the lower compartment of the casing or cabinet 1. This partition 12 may be the motor board upon which the mechanism or motor 13 for rotating the turntable may be supported. The smaller end of the opening in this bracket or rigid non-vibratory portion 9 is substantially circular in cross section, corresponding to and registering with the circular opening in the bushing 7 and from the point of connection between the said bushing and the said bracket, the bracket or rigid non-vibratory portion 9 increases in size and terminates in an enlarged rectangular oblong outwardly flaring socket 15. The opening through the bracket also increases in transverse sectional area downward and gradually changes in shape from circular at its upper end into the oblong shape of the said socket 15 at its lower end. I preferably make this bracket or rigid non-vibratory portion 9 very rigid so the same will not be set into vibration by the sounds conducted or conveyed therethrough by rigidly securing the same to the said thick partition 12 of the cabinet and by bracing or stiffening the same by webs 16—17 at the front and back of the same respectively. If desired the bracket may be made of such proportions and thickness that the bracing by means of the said webs 16 and 17 is unnecessary to prevent the vibration of the same. I preferably make the said bracket or sound conveying portion 9 of metal, as for instance of cast iron since a metal bracket may be easily made sufficiently rigid for my purposes, but any material may be employed by me so long as the same will resist the tendency to vibrate in sympathy with the vibrations of the air contained therein and will rigidly support the sounding boards, hereinafter referred to, at one end only.

Within the larger end of the bracket 9 I support the smaller end of the amplifying portion of the vibratory device, the same consisting of a hollow flattened tapering body 10, having resonant and preferably wooden sides. The top and bottom sides 18 and 19 of the said hollow flattened tapering body 10 are preferably made with thin resonant substantially flat wooden boards, the outer edges of which overlap and are secured in any suitable manner to the edges of the vertically arranged substantially flat wooden supporting boards 20 and 21. The top and bottom sounding boards 18 and 19 are spaced apart from each other and may be substantially parallel or may diverge from

their point of attachment with the said rigid hollow bracket 9, but the edges of the said resonant body 10 preferably diverge considerably, the outer ends of the same being spaced apart from each other by a distance substantially equal to the full width of the cabinet in which the same is inclosed.

While the four sides of the body portion or section of the amplifying device may be made thin and resonant or capable of being set into vibration, I prefer to make the upper and lower sounding boards 18 and 19 of thin resonant material and the sides 20 and 21 of thick and comparatively stiff non-resonant material. In order to produce sounding boards 18 and 19, which will respond quickly to the vibrations impressed upon them and to impart to the sound reproduced the desired amount of amplification and to improve the quality or character of the tones reproduced, I prefer to construct said sounding boards in the manner indicated in Fig. 3, by building up and gluing together a series of boards or blocks 22, so that the sounding board which is to be formed from the same will close the joints between the adjacent boards 22 when glued together at an angle, as plainly indicated in Fig. 3. I then saw or otherwise cut out of the series of boards 22 so glued together, the sounding boards 19 or 20, as the case may be, with the result that the finished sounding board is composed of a plurality of sections of wood cut parallel to the grain, the said pieces being glued together for a considerable distance, notwithstanding the fact that the finished sounding board may be very thin. As is plainly shown in all the figures and as above described, the sounding boards may be described as being composed of a structure composed of substantially overlapping wooden strips having scarfed joints between the same, the grain of said boards being transverse to the length of said sounding board.

If desired I may make the lateral sides 20 and 21 of wooden strips having overlapping or scarfed joints between the strips composing the same in the same manner described above with respect to sides 18 and 19 and as illustrated in Fig. 4 of the drawings, although if desired the said sides 20 and 21 may be thick and non-resonant.

I have found that a sound amplifying device constructed and arranged in the manner above described, that is to say one in which one portion of the amplifier is composed of a flattened hollow body having resonant or vibratory sound amplifying sides or surfaces and in which the said hollow body portion is supported by a rigid non-vibratory portion or bracket and in which the

outer or larger end of the said vibratory portion is out of engagement with any support other than the said rigid non-vibratory portion, effects a loud and pleasing brilliant reproduction of sound of a quality different from that effected by the use of the ordinary conical megaphone or horn, while at the same time it will be apparent that the construction of my amplifier, as above described, occupies less space than that usually required to produce the ordinary desired amplification of the sound. I have also found that a sound amplifying device in which the upper and lower sounding boards are nearly parallel will effect as loud a reproduction of sound as the megaphone or ordinary tapering horn and that the sound reproduced is of a much more pleasing effect and quality than that reproduced with the use of the ordinary horn or megaphone.

The sound waves passing through the rigid non-vibratory bracket or member pass out and between the thin resonant boards of my improved amplifying device. These boards are set into sympathetic vibration with and by the waves being conducted between the same and by the vibration of these sounding boards the sounds are greatly augmented or amplified.

By the use of an amplifier comprising the tapering longitudinally curved rigid bracket or sound conveyer having an opening through which is substantially circular at its inlet end and oblong at its outlet end, and which opens between the transversely oblong body portion of the amplifier, it is possible to amplify the sound to some extent, and at the same time to convey it to the resonant body portion of the amplifier without substantial loss of energy and to utilize with a high degree of efficiency comparatively broad sounding boards without taking up much space vertically in the cabinet of the machine. By making the body portion of the amplifier oblong and comparatively broad horizontally but narrow vertically it is thought a desirable quality is obtained in reproducing sound therewith.

Although only one form has been herein illustrated for which this invention may be embodied, it is obvious that many changes may be made in the construction shown, without departing from the spirit of the invention or the scope of the appended claims.

Having thus fully described my invention what I claim and desire to protect by Letters Patent of the United States is:

1. A sound amplifying device comprising a rigid, substantially non-vibratory section having a sound conveying passage of constantly increasing cross section extending

therethrough, and a hollow vibratory body section comprising exterior sounding boards spaced apart from each other. 65

2. A sound amplifying device comprising a heavy substantially non-vibratory section and a hollow vibratory body section communicating therewith, the passage through said sections being of continuously increasing cross sectional area. 70

3. A sound amplifying device comprising a section having rigid non-vibratory sides, and a body-section communicating therewith having vibratory sides, said sections having a continuous sound conducting passage therethrough. 75

4. A sound amplifying device comprising a substantially non-vibratory section, and a hollow body-section communicating therewith, said body-section having an exterior side consisting of a resonant sounding board. 80

5. A sound amplifying device comprising a substantially non-vibratory section, and a hollow body-section communicating therewith, said body-section having an exterior side consisting of a resonant sounding board, the passage for sound through said sections being of continuously increasing cross sectional area. 90

6. A sound amplifying device comprising a rigid non-vibratory section having a sound conveying passage of constantly increasing cross section extending therethrough, and a plurality of sounding boards supported at one end by said rigid section. 95

7. A sound amplifying device comprising a hollow body having a resonant side composed of a plurality of strips extending transversely to the direction of said body and secured together longitudinally by a scarfed joint. 100

8. A sound amplifying device comprising a hollow body having opposite exterior resonant sides, each composed of a plurality of strips extending transversely to the direction of said body and having their side edges secured together by a scarfed joint. 105

9. In a sound amplifying device, a hollow non-vibratory support, and a plurality of longitudinally scarfed boards supported at one end by said support. 110

10. A sound amplifier comprising a hollow relatively non-vibratory support forming the neck of said amplifier, and a hollow body portion connected at one end to one end of said support and communicating therewith, said body portion comprising a sounding board consisting of a plurality of strips joined together in a single plane and extending transversely of said body portion. 115

11. A sound amplifier for talking machines, comprising a substantially non-vibratory hollow portion and a hollow vi-



bratory portion connected thereto and communicating therewith, said portions forming a smooth continuous conduit for sound waves, said conduit being free from any sudden change in direction.

12. A sound amplifier for talking machines, comprising a substantially non-vibratory hollow portion and a hollow vibratory portion connected thereto and communicating therewith, said portions forming a smooth continuous conduit for sound waves, said conduit being free from any sudden change in cross-sectional area.

13. A sound amplifier for talking machines, comprising a substantially non-vibratory hollow portion and a hollow vibratory portion connected thereto and communicating therewith, said portions forming a smooth continuous conduit for sound waves, said conduit being free from any sudden change in direction or in cross-sectional area.

14. A sound amplifier for talking machines, comprising a hollow relatively non-vibratory portion forming the inlet end thereof and a hollow relatively vibratory portion connected to said first mentioned portion and communicating therewith and forming the delivery end of the amplifier, said portions forming a continuous passage for sound waves, free from any sudden change in direction or transverse sectional area, the said passage gradually increasing in transverse area throughout its full length.

15. A sound amplifier for a talking machine, comprising a hollow body forming a sound passage and including a sounding board formed of a plurality of strips having longitudinal edges joined together and extending transversely of said body.

16. A sound amplifier for talking machine, comprising a hollow body forming a sound passage and including a sounding board formed of a plurality of strips extending in the same plane and having longitudinal edges joined together and extending transversely of said body.

17. A sound amplifier for talking machines, comprising comparatively rigid spaced supports and comparatively yielding spaced sounding boards connecting said supports and forming therewith a sound conduit.

18. A sound amplifier for talking machines, comprising comparatively rigid spaced supports and comparatively yielding spaced sounding boards connecting said supports and forming therewith a sound conduit oblong in transverse section.

19. A sound amplifier comprising a pair of spaced elongated comparatively narrow and thick exterior diverging supports and

a pair of elongated relatively broad and thin spaced exterior sounding boards connecting said supports and forming a hollow body substantially oblong in transverse section.

20. A sound amplifier, comprising a hollow body portion tapering exteriorly and interiorly longitudinally in one direction both in width and in thickness and including a pair of elongated comparatively narrow and thick exterior diverging supports and a pair of comparatively broad and thin exterior diverging sounding boards connecting said supports.

21. A sound amplifier, comprising a hollow body portion tapering exteriorly and interiorly longitudinally in one direction both in width and in thickness and including a pair of elongated comparatively narrow thick and non-vibratory exterior diverging supports and a pair of comparatively broad thin and resonant exterior diverging sounding boards connecting said supports.

22. A sound amplifier comprising a hollow body portion including a sounding board consisting of a plurality of flat, oblong, wooden strips having the grain of the wood extending longitudinally thereof and said strips being arranged consecutively in the same plane, the longitudinal edge of one strip being connected to the longitudinal edge of an adjacent strip, said strips extending transversely of said body portion.

23. A sound amplifying device comprising a hollow body portion, provided with an outlet spaced from said inlet and including a wooden sounding board in which the grain of the wood is arranged transversely of the path of the sound waves between said inlet and said outlet, said sounding board being composed of a plurality of flat, oblong strips cut lengthwise of the grain and arranged consecutively in substantially the same plane, the longitudinal edge of one strip being joined to the longitudinal edge of an adjacent strip.

24. A sound amplifier including a wooden sounding board composed of a plurality of oblong, flat, strips cut longitudinally of the grain of the wood and arranged consecutively in substantially the same plane, each strip having a transversely acute, longitudinal, beveled edge overlapping and joined to a correspondingly and oppositely beveled, longitudinal edge of an adjacent strip, said strips being arranged transversely of said amplifier.

25. A sound amplifier for talking machines comprising a substantially non-vibratory hollow portion provided with a tapering passage therethrough, said passage

terminating at its larger end in an oblong outlet, the major axis of which is considerably greater than its minor axis, and a hollow transversely oblong vibratory portion  
5 communicating with said outlet.

26. A sound amplifier for talking machines comprising a substantially non-vibratory hollow portion provided with a tapering passage therethrough, said passage  
10 terminating at its larger end in an oblong outlet, the major axis of which is considerably greater than its minor axis, and a hollow transversely oblong longitudinally tapering vibratory portion having an oblong  
15 inlet at its smaller end communicating with said outlet.

27. A sound amplifying device comprising a substantially non-vibratory hollow section, and a hollow body section communicating therewith, said body section having  
20 an exterior vibratory side.

28. In a sound amplifier for talking machines, a substantially non-vibratory hollow bracket provided with a tapering passage therethrough, said passage terminat-  
25 ing at its larger end in an oblong outlet.

In witness whereof I have hereunto set my hand this 12th day of January 1910.

JOHN C. ENGLISH.

Witnesses:

WM. EARLY,

HARRY COBB KENNEDY.

---

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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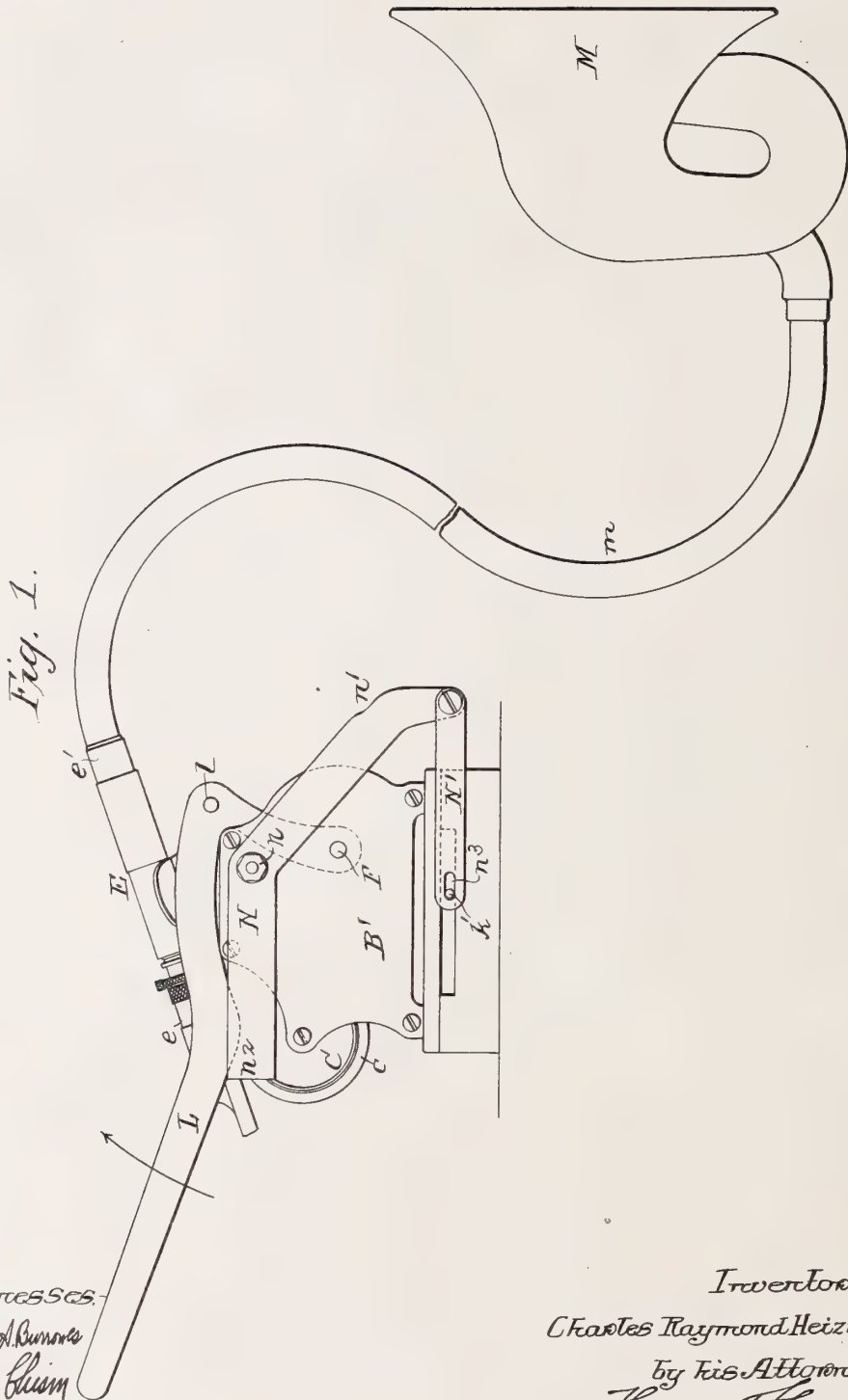
C. R. HEIZMANN.  
 AUTOMOBILE HORN.

APPLICATION FILED AUG. 25, 1910.

1,023,016.

Patented Apr. 9, 1912.

3 SHEETS—SHEET 1.



WITNESSES:  
 Will A. Rumore  
 Walter Blum

Inventor.—  
 Charles Raymond Heizmann.  
 By His Attorneys—  
 Horace Howard



C. R. HEIZMANN.

AUTOMOBILE HORN.

APPLICATION FILED AUG. 25, 1910.

Patented Apr. 9, 1912.

3 SHEETS—SHEET 2.

1,023,016.

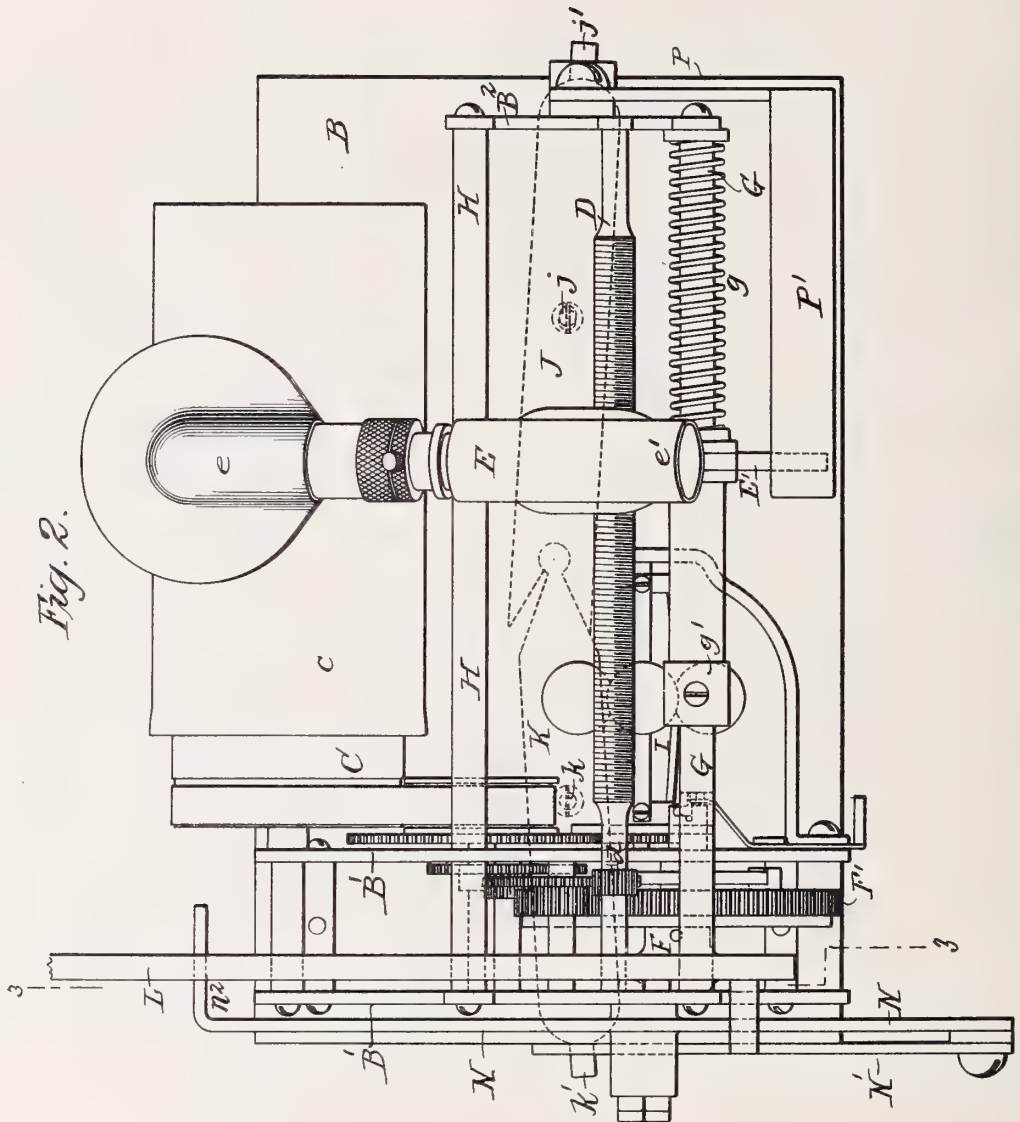


Fig. 2.

Witnesses—

Walter A. Burrows  
Walter Blum

Inventor—

Charles Raymond Heizmann.

by his Attorneys—  
Howson & Howson





C. R. HEIZMANN.  
AUTOMOBILE HORN.

APPLICATION FILED AUG. 26, 1910.

Patented Apr. 9, 1912.

3 SHEETS-SHEET 3.

1,023,016.

Fig. 3.

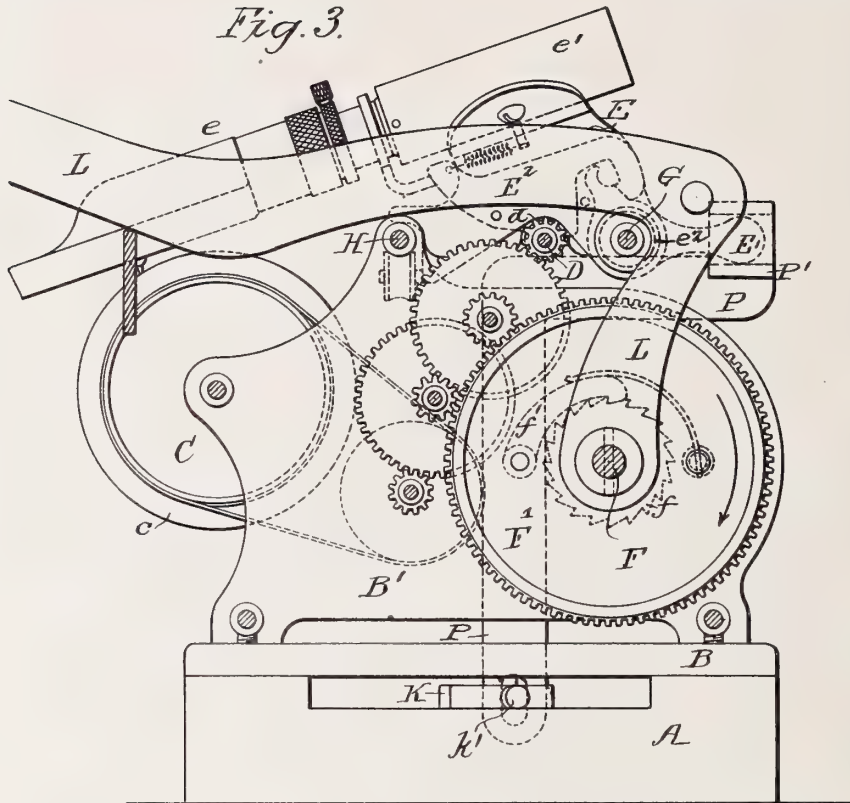
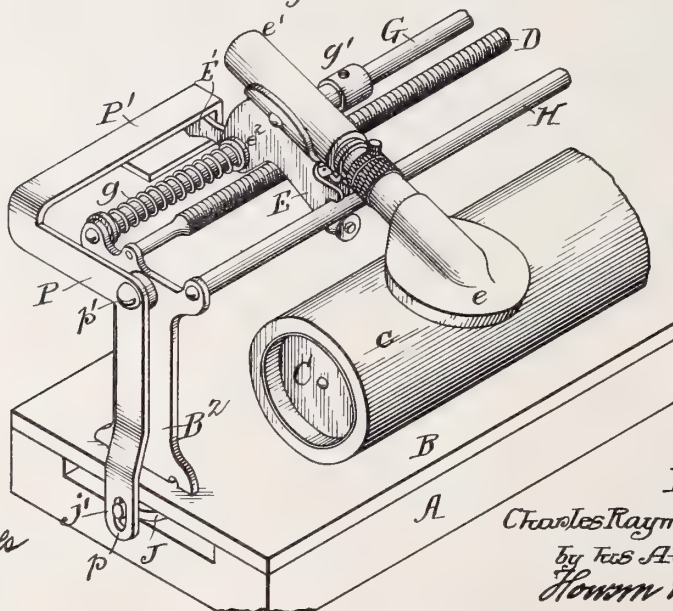


Fig. 4.



Witnesses—  
Wills A. Curran  
Walter Blum

Inventor—  
Charles Raymond Heizmann  
by His Attorneys—  
Horn & Horn

# UNITED STATES PATENT OFFICE.

CHARLES RAYMOND HEIZMANN, OF READING, PENNSYLVANIA.

## AUTOMOBILE-HORN.

1,023,016.

Specification of Letters Patent.

Patented Apr. 9, 1912.

Application filed August 25, 1910. Serial No. 578,875.

*To all whom it may concern:*

Be it known that I, CHARLES RAYMOND HEIZMANN, a citizen of the United States, and a resident of Reading, Pennsylvania, have invented certain Improvements in Automobile-Horns, of which the following is a specification.

The object of this invention is to provide means for producing certain given sounds through a horn.

The invention is particularly adapted for use on automobiles or other vehicles in sounding an alarm.

In the accompanying drawings:—Figure 1, is a side view of my improved device illustrated in connection with an automobile horn; Fig. 2, is a plan view; Fig. 3, is a sectional view on the line 3—3, Fig. 2; and Fig. 4, is a perspective view of a portion of the device.

The invention can be used in connection with any sound reproducing mechanism, and, in the drawings, I have illustrated a graphophone construction using a cylinder upon which are the indentations for producing given sounds. This device is preferably placed in close proximity to the seat of the automobile driver so that he can operate the lever in place of the air bulb, although the device can be placed at any point and the lever actuated through operating mechanism without departing from the essential features of the invention. The horn can be placed at any convenient point and connected with the instrument by any flexible tubing.

A is the base upon which the graphophone is mounted.

B is the base plate of the graphophone and B'—B<sup>2</sup> are the vertical supports for the mechanism.

C is the drum on which the tubular record *c* is mounted.

D is the feed screw for traversing the carrier E.

F is the main shaft on which is mounted the ratchet wheel *f*, which is engaged by a pawl *f'* on a gear wheel F' loosely mounted on the said shaft F. A train of gears transmits the motion from the gear wheel F' to a pinion *d* on the shaft D. On one of the intermediate shafts is a belt pulley around which passes a belt for driving the drum C. On the carrier E is mounted the speaker *e*

having the needle which contacts with the record.

G and H are two bars which are parallel with the screw shaft D and are supported at their outer ends, as well as the screw shaft by a bearing B<sup>2</sup>.

I is the governor for limiting the speed of the mechanism.

All of the above described mechanism forms part of an ordinary graphophone.

In place of using the entire record a given portion of the record may be used over and over again as by the mechanism which I will proceed to describe the carrier E is traversed forward by the screw and returned to its original position by a spring. If, for instance, a section of a bugle call is on the record, the speaker can be so set in respect to the record that the bugle call can be repeated over and over again as the mechanism is operated by the chauffeur to sound an alarm; taking the place of the usual practice of blowing a horn.

M is the horn which may be of any suitable type connected by a flexible tube *m* to the end *e'* of the carrier which communicates with the speaker so that any sound produced at the speaker will be passed through the horn.

L is the operating lever pivoted to the shaft F, as clearly illustrated in Fig. 3. This lever is fastened to the shaft and when moved in a forward direction as shown by the arrow, Fig. 1, turns the shaft and through the medium of the ratchet *f*, the gear F' in the direction of the arrow, Fig. 3, thereby driving the record, and at the same time turning the screw shaft D and feeding the carrier forward so that the speaker will pass at the proper speed over the face of the record thus producing the sound recorded on the record. On the return movement of the lever L toward its normal position the ratchet wheel *f* moves past the pawl *f'* without turning the wheel F'.

Pivoted at *n* to the frame B' is a rocker N which is actuated by a pin *l* on the lever L striking one arm of the rocker at *n'* as the lever nears the end of the forward stroke. When the lever is returned it strikes the rocker at *n*<sup>2</sup> shifting it to the position indicated in Fig. 1. This rocker N is connected by a link N' to a lever K pivoted at *k* to the base of the machine and this



lever has a projection  $k'$  which extends through a slot  $n^3$  in the link  $N'$  so as to provide a certain amount of lost motion.

One arm of the lever  $K$  engages one arm  
5 of the lever  $J$  pivoted at  $j$  to the base of the machine and this lever  $j$  has a projection  $j'$  which extends into a slot  $p$  in a rocking lever  $P$  pivoted at  $p'$  to the bearing  $B^2$ . This rocking lever has an extension  $P'$  in  
10 which travels one arm of a lever  $E'$  which is mounted on the hub  $e^2$  of the carrier and is arranged to throw the threaded lever  $E^2$  into and out of gear with the screw shaft  $D$  so that when the operating lever  $L$  is thrown  
15 over to its forward position the projection  $l$  on the lever will strike the rocker  $N$  and the motion will be communicated to the rocking lever  $P$ , throwing the threaded lever  $E^2$  out of mesh with the threads on the screw shaft  $D$  stopping the forward move-  
20 ment of the carrier. A spring  $g$  on the rod  $G$  returns the carrier to its original position against a stop  $g'$  on the rod so that when the carrier is moved forward again the  
25 bugle call or other record will be repeated; the spring  $g$  being compressed on the forward movement of the carriage. When the lever  $L$  is returned to its normal position shown in Fig. 1, it actuates the rocker  $N$   
30 and re-sets the threaded lever  $E^2$  into engagement with the screw shaft so that on the forward movement of the lever the speaker will immediately travel over the record, reproducing the sound.

35 While I have shown my invention as adapted for use in a graphophone of the type illustrated, it will be understood that the mechanism for producing sound may be varied without departing from the essential fea-  
40 tures of the invention.

While I have illustrated and described two levers  $K$  and  $J$  for transmitting motion from one end of the machine to the other, it will be understood that in some types of  
45 machines the gearing may be changed so that a single lever may be used for actuating the rocking lever  $P$ .

Certain of the details of construction may be modified without departing from the es-  
50 sential features of the invention as the construction will depend materially upon the type of sound-producing instrument used.

It will thus be seen by the above described invention that any short record can be re-  
55 produced as a signal warning on an automobile or other vehicle and that the record can be repeated as often as desired.

I claim:

1. The combination in a signaling device  
60 for vehicles, of a sound producing mechanism including a record and a speaker in engagement therewith; a hand lever located adjacent the driver seat; means operatively connecting the lever and the sound produc-  
65 ing device so that when the hand lever is

initially moved forward a signal will be given and upon the continuance of the forward movement the speaker will be returned to its normal position to duplicate the signal upon the next forward movement of the  
70 hand lever, said hand lever when returned to its normal position tending to keep the carrier in engagement with the feeding means.

2. In a signaling device for vehicles hav-  
75 ing a horn, the combination of a speaker carrier, a record holder, a shaft; a hand lever keyed to the shaft; a ratchet wheel keyed to the shaft; a gear wheel loose on the shaft; a  
80 pawl on the gear wheel and engaging the ratchet when the latter is moved by the forward movement of the hand lever; means actuated by the gear wheel to move the record and to feed the carrier in one direc-  
85 tion; means actuated by the forward movement of the hand lever to disengage the carrier from the feeding means; means independent of the gear wheel for moving the carrier in the opposite direction when the  
90 latter is disengaged from the feeding means; said hand lever operating to engage the carrier with the feeding means when returned to its normal position.

3. In a signaling device the combination of a horn; a record holder; a speaker carrier  
95 connected to the horn; a shaft; a hand lever keyed to the shaft; a ratchet keyed to the shaft; a pawl; means loose on the shaft and supporting the pawl; said pawl engaging the ratchet when the hand lever is initially  
100 moved forward to actuate the carrier; means actuated by the pawl supporting means for rotating the record to produce a sound; means actuated by the pawl supporting means to feed the carrier in one direction;  
105 means independent of the pawl supporting means for moving the carrier in the opposite direction; a pivotally mounted double ended lever; means connecting one end of the double ended lever to the speaker carrier;  
110 means on the hand lever and engaging the double ended lever during the forward movement of the said hand lever to disengage the speaker from the feeding means; said hand lever engaging the double ended lever  
115 during the return movement to move the speaker carrier into engagement with the feeding means; said hand lever being so designed as to normally rest on the double ended lever and keep the speaker in positive  
120 contact with the carrier feeding means.

4. The combination in a signaling horn in automobiles or other vehicles of a sound producing device including a record and a  
125 speaker in engagement therewith; means for conveying the speaker over the record; a hand lever located adjacent the driver seat; means operatively connecting the lever and the sound producing device so that by pressing the lever forward a predetermined sig-  
130

nal will be given and the speaker return to  
its normal position to duplicate the signal  
upon the next forward movement of the  
hand lever; a pivotedly mounted yoked le-  
5 ver; an arm on the speaker and extending  
through the yoked portion of the yoked  
lever; a pivotedly mounted double ended  
lever; and means connecting one end of the  
yoked lever with one end of the double ended  
10 lever; said hand lever being operable on said

double arm lever to actuate the yoked lever  
to cause the speaker to engage or disengage  
the conveying means.

In testimony whereof, I have signed my  
name to this specification, in the presence of 15  
two subscribing witnesses.

CHARLES RAYMOND HEIZMANN.

Witnesses:

J. T. WANNER,

HARRY L. GROSS.

---

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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1,023,047.

5 SHEETS—SHEET 1.

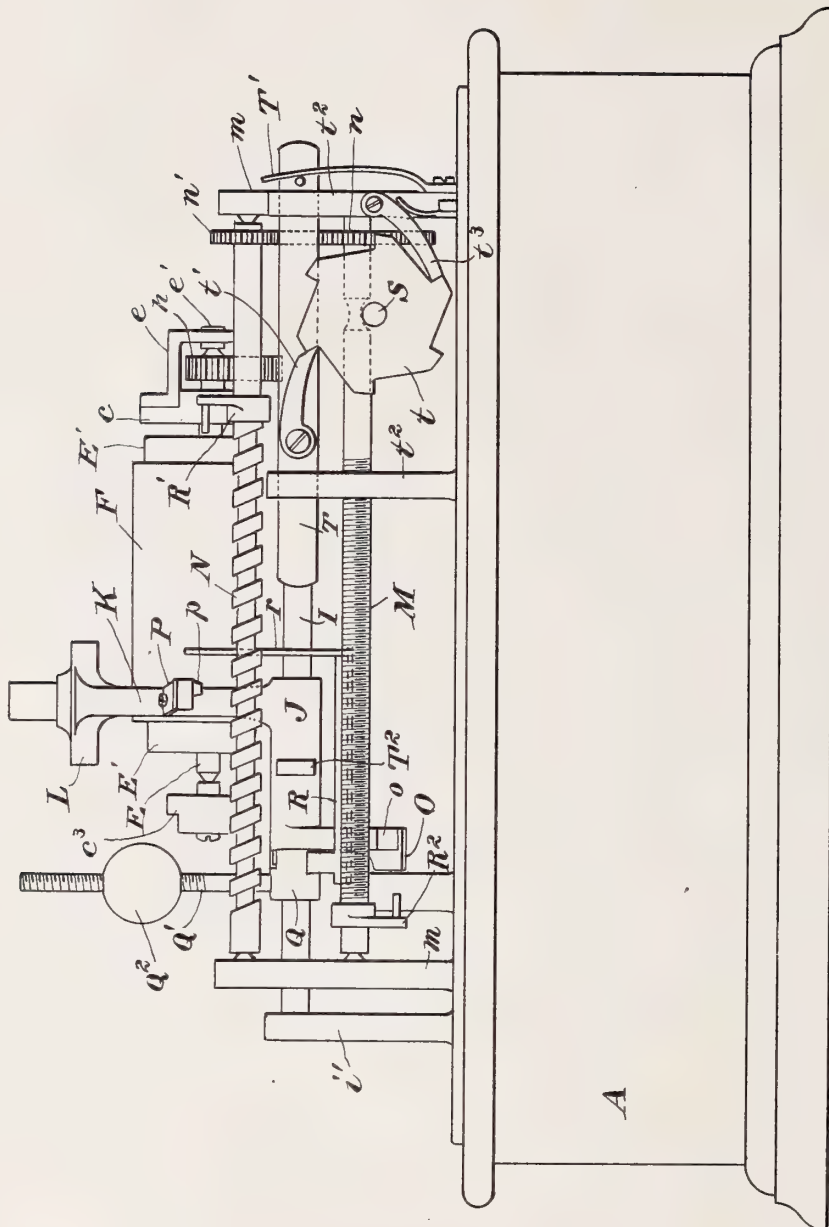


Fig. 1.

Robert Haad  
V. E. Nichols

BY  
Griffith Bernhard  
ATTORNEYS





1,023,047.

5 SHEETS—SHEET 2.

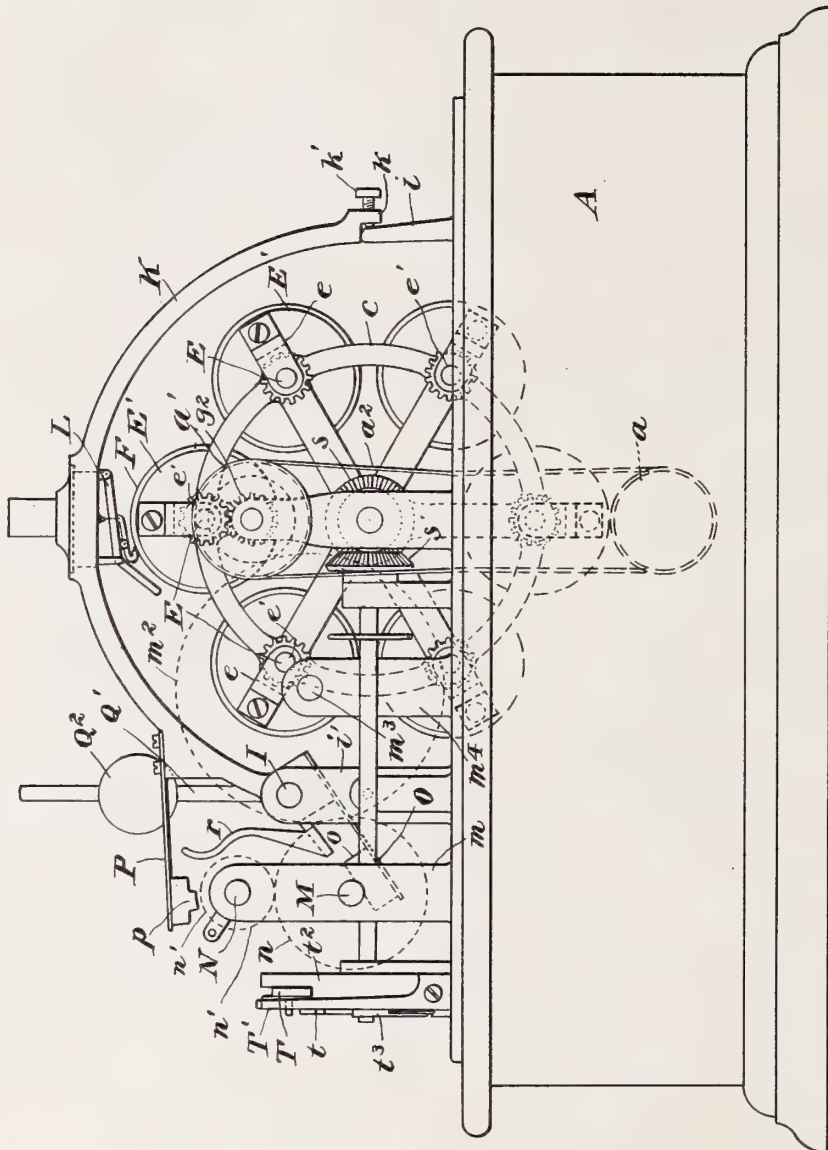


Fig. 2.

Robert Had  
V. E. Nichols

INVENTOR  
*Richard B. Smith,*

BY  
*Griffin & Bernhard*  
ATTORNEYS

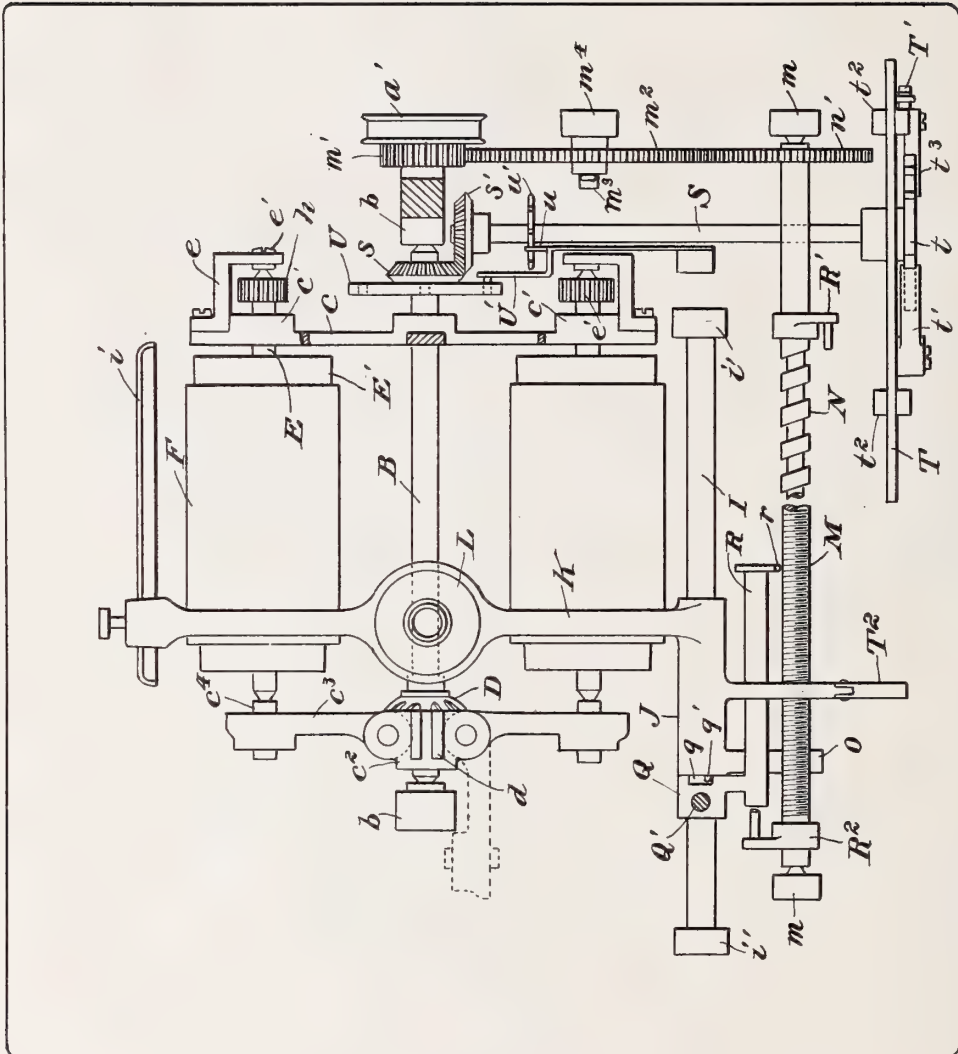


R. B. SMITH.  
 MULTIPLE RECORD PHONOGRAPH.  
 APPLICATION FILED FEB. 8, 1906.

1,023,047.

Patented Apr. 9, 1912.

5 SHEETS—SHEET 3.



WITNESSES:

*Robert Haad*  
*V. E. Nichols*

*Fig. 3.*

INVENTOR  
*Richard B. Smith,*

BY  
*Griffins Burkhard*  
 ATTORNEYS





R. B. SMITH.  
 MULTIPLE RECORD PHONOGRAPH.  
 APPLICATION FILED FEB. 8, 1906.

1,023,047.

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5 SHEETS—SHEET 4.

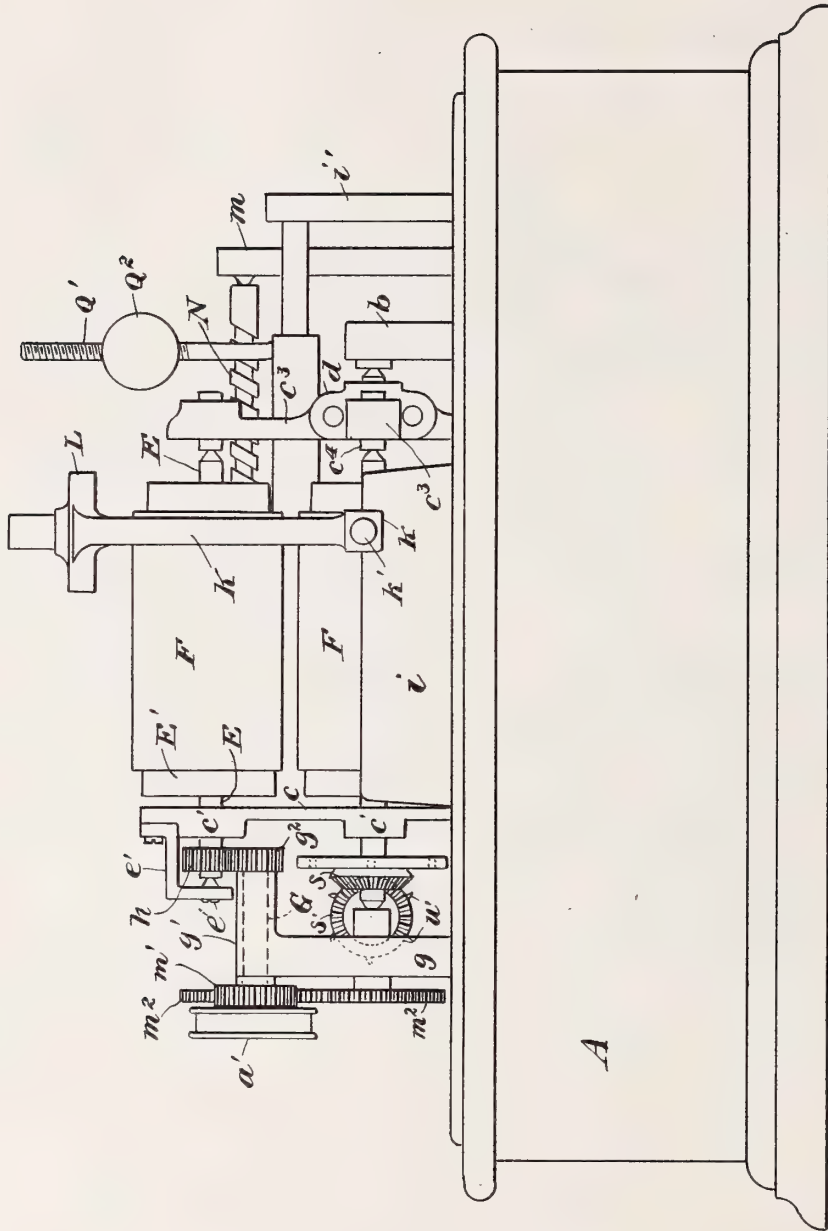


Fig. A.

WITNESSES:  
 Robert Head  
 V. E. Nichols

INVENTOR  
 Richard B. Smith;  
 BY  
 Griffin & Bernhard  
 ATTORNEYS

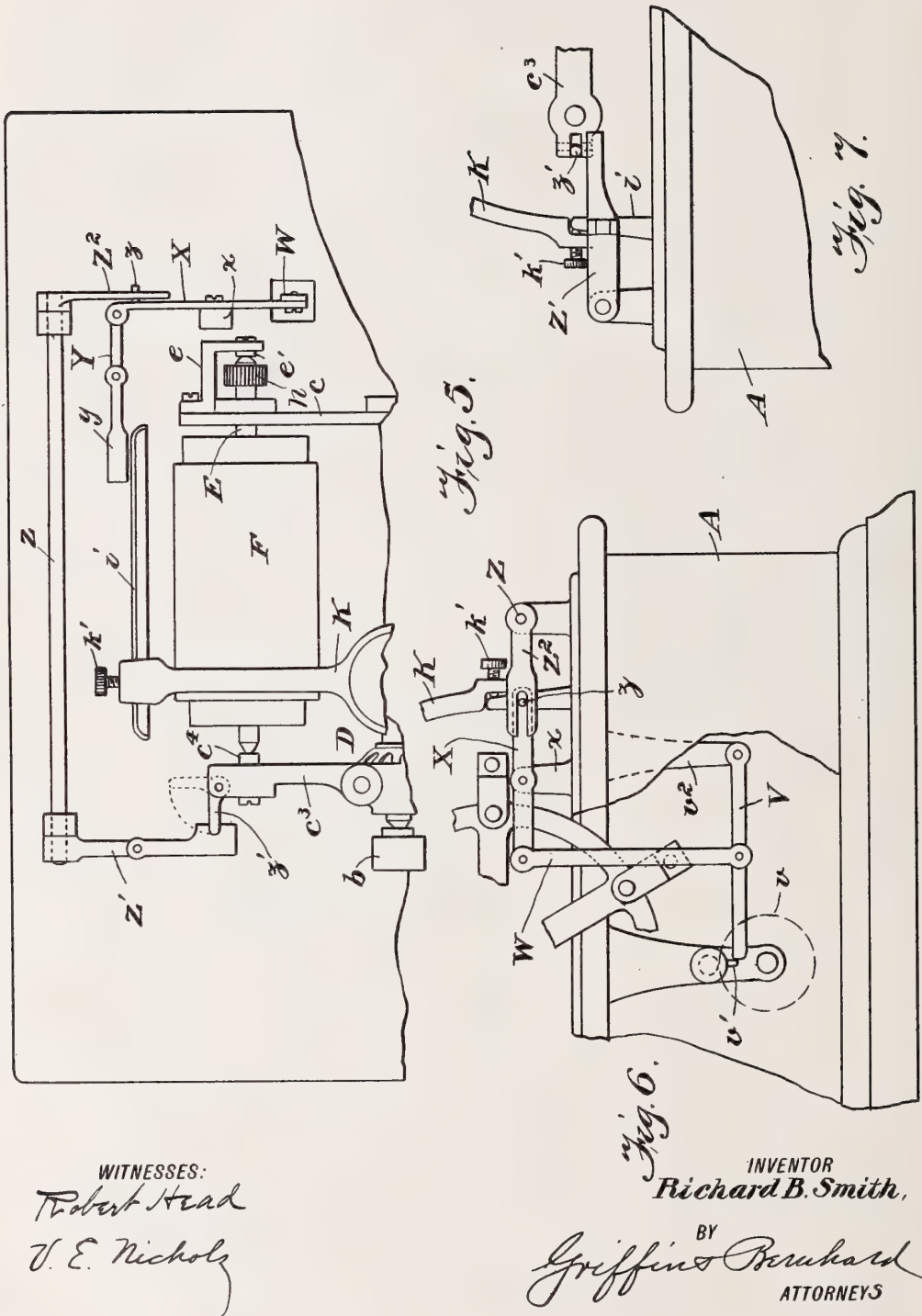


R. B. SMITH.  
 MULTIPLE RECORD PHONOGRAPH.  
 APPLICATION FILED FEB. 8, 1906.

1,023,047.

Patented Apr. 9, 1912.

5 SHEETS—SHEET 5.



WITNESSES:

*Robert Head*  
*V. E. Nichols*

INVENTOR

*Richard B. Smith,*

BY

*Griffins Bernhard*  
 ATTORNEYS

# UNITED STATES PATENT OFFICE.

RICHARD B. SMITH, OF SYDNEY, NEW SOUTH WALES, AUSTRALIA.

## MULTIPLE-RECORD PHONOGRAPH.

1,023,047.

Specification of Letters Patent.

Patented Apr. 9, 1912.

Application filed February 8, 1906. Serial No. 300,027.

*To all whom it may concern:*

Be it known that I, RICHARD BARTHOLOMEW SMITH, a subject of the King of Great Britain, residing at Sydney, New South Wales, Australia, have invented certain new and useful Improvements in Multiple-Record Phonographs, of which the following is a specification.

My invention relates to phonographs wherein I employ means for carrying a plurality of records, say four, six or more, each of which is adapted to be brought into co-operative relation to a reproducer in such manner that the record will remain in place and be rotated axially while the reproducer travels along said record, after which the next record is brought into position with relation to the reproducer, so that the aforesaid operations may be repeated, and so on throughout the number of records used in the machine.

The machine embodies a carrier for the desired number of records, means for holding the carrier at rest, means for rotating one record while the carrier is at rest, a reproducer, and means for imparting traversing motion to the producer.

One feature of novelty of the new machine consists in an automatic feed mechanism for the record carrier. This mechanism includes a shaft geared to the record-carrier, a sliding member, a pawl and ratchet device actuated by the sliding member for operating the aforesaid shaft, and means for moving the sliding member. In connection with the shaft and the record carrier I have provided a locking mechanism which holds the carrier at rest, but which is releasable automatically at the period of moving the carrier, so as to present a new record to the reproducer.

Another feature of my apparatus is a means for returning the reproducer automatically to its starting position after said reproducer shall have traversed one of the records. In addition to the common feed screw, my machine is equipped with a coarse thread feed screw which is suitably driven, and the traveler is equipped with two nuts or nut sections which are adapted to respectively engage with the feed and return screws. A shiftable tension arm is as-

sociated with the traveler so as to hold it in one position or the other, in order that the feed nut or the return nut may have engagement properly with the feed screw or the return screw, according as one or the other is in operation. Combined with this tension arm are tripping devices, one on the feed screw and the other on the return screw, said devices being so related to the arm as to automatically shift the same when the traveler reaches the limit of its motion in one direction or the other.

Various other features of my machine will be hereinafter described and defined by the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, wherein like characters of reference are used to indicate corresponding parts in the several figures of the drawings.

Figure 1 is an elevation looking at the rear of a multiple record phonograph, constructed in accordance with my invention; Fig. 2 is an end elevation looking at the right hand end of the machine shown by Fig. 1; Fig. 3 is a plan view of the invention, parts being broken away and in section, in order to more clearly represent other parts; and Fig. 4 is an elevation looking at the front side of the machine; Fig. 5 is a plan view of a part of the machine illustrating automatic stop devices by which the record carrier may be arrested at the end of the reproduction on each record or at every record or third record; Fig. 6 is an elevation looking at one end of the devices shown by Fig. 5, and Fig. 7 is a view looking at the other end of Fig. 5.

A designates a suitable base, herein shown in the form of a casing adapted to inclose the motor or driving mechanism for the operation of the several parts of the machine. I have not considered it necessary to show in detail the motor, but in Fig. 2, the driving pulley is indicated by dotted lines at *a*. On the base *A* are the posts *b*, having suitable bearings for the shaft *B* of a record carrier. This carrier is shown by the drawings in the form of a skeleton reel, which is constructed to accommodate a desired number of mandrels for the appropriate number of record cylinders, said record car-



rier being adapted to rotate on a horizontal axis, although the carrier normally remains at rest or in a locked position, while the reproducer is operated to have traveling motion with respect to one of the records in said carrier. The carrier is shown as having a spider  $c$  at one end, said spider being provided with a plurality of bearings  $c'$ . At the other end of the carrier is a hub  $c^2$ , which is equipped with a plurality of arms  $c^3$ , the latter corresponding in number to the radial members of the spider  $c$ , and being provided with appropriate bearings  $c^4$ , which are in alinement with the bearings  $c'$  of the spider  $c$ . The arms  $c^3$ , however, are pivoted to the hub  $c^2$ , in order that each arm and the bearing  $c^4$  may be adjusted to the position indicated by dotted lines in Fig. 3, thus throwing the arms  $c^3$  out of register with a record cylinder on one of the mandrels for the purpose of removing and interchanging the record cylinders on said carrier. The hub  $c^2$  and the pivoted arms  $c^3$  constitute another spider, the members of which are adjustable, whereas the members of the spider  $c$  are non-adjustable. The pivoted arms  $c^3$  are held in their working positions by the spring members or fingers  $d$  of a plate spring D, which is fastened to the carrier shaft B, or to the hub  $c^2$ , said members or fingers  $d$  being arranged to act against the pivoted ends of the arms  $c^3$ , for the purpose of holding them in their radial working positions. The spider  $c$  is equipped with a number of brackets  $e$ , which are fastened thereto on the outer side of the record carrier, as shown by the several figures of the drawings, and each bracket is equipped with a bearing  $e'$ , which is in alinement with one of the bearings  $c'$  of the spider  $c$ .

A plurality of arbors E are journaled in the bearings  $c'$  and  $e'$  of the carrier spider  $c$ , one end of each arbor being pointed so as to engage one bearing  $e'$ . Each arbor has its other end pointed to be journaled in one bearing  $c^4$ , on a pivoted arm  $c^3$  of the other spider, whereby each arbor E is mounted to rotate freely in the bearings of the respective spiders, and at the same time said arbor is so mounted in the spider  $c$  and one of its brackets  $e$ , that it will be properly supported when the arm  $c^3$  is adjusted away from the unsupported end of the arbor, for the purpose of interchanging the records of the mandrel of the arbor. It will be understood that each arbor E is equipped with a mandrel E', on which is adapted to be placed a cylindrical record, the latter being indicated at F. It will be understood, furthermore, that the mandrel E' and the record F, are adapted to rotate with the arbor E, and for the purpose of driving the arbor E when the record thereon is presented to

a reproducer, I have provided the following mechanism: A post  $g$  is erected on the base A, and is provided with a shaft bearing  $g'$ , see Fig. 4. In this bearing is a short shaft G, on one end of which is secured a spur gear pinion  $g^2$ . Each arbor E is provided between the spider  $c$  and the bracket  $e$  with a pinion  $h$ , and when the carrier is rotated one step so as to bring a fresh record into coöperative relation to a reproducer, the pinion  $h$  on the arbor of the record which is thus presented is adapted to mesh with the pinion  $g^2$  on the shaft G, whereby the arbor and the record are adapted to rotate on their axes. The shaft G is extended at one end beyond the bearing  $g'$ , which is in alinement with the driving pulley  $a$ , and these two pulleys  $a$ ,  $a'$ , are connected operatively by an endless driving belt  $a^2$ , as indicated by full and dotted lines in Fig. 2, whereby the shaft G is driven automatically from the motor.

Near the front side of the machine is a horizontal track rail  $i$ , and in suitable posts  $i'$  near the rear side of the machine is a track rod I, the latter being parallel to the rail  $i$ . On the track rod I is a traveler J, and from this traveler extends an arched or bowed reproducer carrier K, the latter being rigid with the traveler J, and extending over the record carrier, so that the free end of the reproducer carrier may have engagement with the rail  $i$ , for the purpose of resting thereon during the period that the carrier K is operated to impart the traversing movement to a reproducer L in contact with one of the cylinder records in the record carrier. The reproducer L may be of the usual or any preferred form, and it is shown as being mounted centrally on the arched carrier K, so as to have engagement with the uppermost record in the record carrier. The arched carrier K is represented by Fig. 2 as having a notched free end  $k$ , adapted for engagement with the rail  $i$ , and in this notched end is fitted a bolt  $k'$ , which is adapted to be moved inward so as to rest on the rail for the purpose of lifting the record carrier so as to maintain the reproducer above the record and prevent it from engaging therewith during the operation of removing and replacing the records.

My machine is equipped with two screw shafts or spindles, the same being located on the rear side of the machine, and being disposed in horizontal parallel positions, one above the other. For the purpose of distinguishing the two screw spindles, I will designate one of them as the feed screw M, while the other will be designated as the return screw N. The feed screw M is provided with a continuous fine screw thread, while the return screw has quite a coarse thread running in an opposite direction to

the fine thread of the screw M. The two screws are journaled in appropriate bearings of the post  $m$ , which are erected on the base A, and said screws are driven from the shaft G by the following means. In addition to the gear pinion  $g^2$ , and the pulley  $a'$ , the shaft G is provided with a gear  $m'$ , which meshes with an idle gear  $m^2$ , that is mounted on a shaft  $m^3$  in the post  $m^4$ , as indicated by full and dotted lines in Fig. 2. This gear  $m^2$  in turn meshes with a gear  $n$  on the screw M. It will be seen that the gear  $m'$  of the shaft G drives the gear  $m^2$ , which in turn drives the gear  $n$  of the feed screw M, and this gear  $n$  in turn drives the gear  $n'$  of the return screw N.

The traveler J is provided with two arms, O, P, the former extending in an inclined direction below the feed screw M, while the latter extends from the reproducer carrier in a horizontal direction, so as to lie over the return screw N. The arm O is provided at its free end with a feed nut  $o$ , adapted to have engagement with the feed screw M, whereby the required motion will be given by the feed screw to the traveler for moving it in one direction along the slide rod I. The arm P has a return nut  $p$ , which is adapted to mesh with the threads of the return screw N, but the arms O, P, are so related to the traveler and to the two screws that only one of the arms will be presented in position for the nut thereon to engage with one of the screws, the nuts  $o$  and  $p$  being adapted for engagement alternately with the feed and return screws, respectively.

I have equipped my machine with means for automatically reversing the position of the traveler J, as it approaches the limit of its movement in either direction, so as to shift the feed nut out of engagement with the feed screw and simultaneously place the return nut into engagement with the return screw, and vice versa. Loosely mounted on the traveler J at one end thereof is a short collar Q, said collar being provided with a slot  $q$ , in which is adapted to play a stud or pin  $q'$ , the latter being fast with the traveler J, as shown by Fig. 3. The collar Q is shown as having an upstanding arm  $Q'$ , on which is affixed the weight  $Q^2$ , and this collar with its weight is adapted to be shifted for a limited distance within the length of the slot  $q$ , in order that the weight may be placed to one side or the other of the vertical plane of the traveler, for the purpose of holding said traveler in the required position to maintain the feed nut in engagement with the feed screw or the return nut in engagement with the return screw. The collar Q is, furthermore, provided with an arm R, which extends alongside of the feed screw M, and is provided with an upstanding fin-

ger  $r$ , the latter being disposed in the path of a trip  $R'$  on the return screw N. The feed screw M is also provided with a trip  $R^2$ , which is adapted for engagement with the finger  $r$ , and as the traveler moves in one direction or the other, the finger is brought into engagement with one trip or the other on the screws, so as to reverse the position of the weighted collar, and thereby shift the traveler so that the nuts will be moved, the one into engagement with one screw and the other out of engagement with the other screw.

When the feed screw M operates to impart movement to the traveler J, the carrier K and the reproducer L, so as to make said reproducer traverse the cylindrical record which is properly presented thereto by the record carrier, the feed nut  $o$  on the arm O is held in engagement with said feed screw M by the weight  $Q^2$  on the stem or arm  $Q'$ , and at the same time the free end of the reproducer carrier K rests on the track rail  $i$ , while the nut  $p$  is lifted from engagement with the reverse screw N. As the traveler J reaches the limit of this movement toward the left in Fig. 3, a part of the trip  $R^2$  engages with the arm O, so as to depress the latter for the purpose of releasing the feed nut  $o$  from engagement with the screw M, thus arresting the motion of the traveler J in one direction. This operation turns or rocks the traveler on the slide rod I, and the stud  $q'$  thereof operates on the collar Q, so as to shift or turn the position of said collar and of the weighted arm  $Q'$ , thereby moving the carrier K and the arm P, so that the free end of said carrier will not engage with the rail  $i$ , while the return nut  $p$  will be depressed into engagement with the thread of the return screw N. As said return screw is driven from the feed screw M, it follows that the nut  $p$  will be operated to move the traveler in the opposite direction so as to return the carrier K, and the reproducer L, back to the starting point. The return movement of the parts will be at a faster speed than the feed motion given thereto by the screw M, because the return screw N has a coarse thread of quick pitch, but as the traveler reaches the limit of its movement toward the right of Fig. 3, the trip  $R'$  will engage with the finger  $r$ , on the arm R in a way to again rock or turn the carrier J, and thereby disengage the return nut  $p$  from the return screw N, and simultaneously move the feed nut  $o$  into engagement with the feed screw M, as will be readily understood.

The means for automatically turning the record carrier one step at a time operates in unison with the traveler J, as I will now proceed to describe. The shaft B of the record carrier is provided with a bevel gear  $s$ , having meshing engagement with another



bevel gear  $s'$  on a horizontal shaft S, the latter being journaled in appropriate bearings, and extending, substantially, at right angles to the shaft B. At its rear end this shaft S is provided with a ratchet  $t$ , with which engages a feed pawl  $t'$ , the latter being pivoted to a feed slide T, supported in a horizontal position by suitable posts  $t^2$ . One post is provided with a check pawl  $t^3$ , which is adapted for engagement with the ratchet  $t$ , so as to hold the shaft S against rotation in its bearings, except when operated upon by the pawl  $t'$ . The slide T is normally impelled in one direction by a suitable retractor, such as the spring T'. The slide T is disposed in the path of an arm T<sup>2</sup>, which projects rearwardly from the traveler J, as shown by Figs. 1 and 3, and as the traveler is returned by the action of the screw N on the nut  $p$ , this projection or arm T<sup>2</sup> engages with the slide T, so as to move the pawl  $t'$  toward the right in Fig. 1. This operation turns the ratchet  $t$  a distance equivalent to one tooth thereof, and the shaft S is thus given a partial turn for the purpose of rotating the shaft B and the record carrier, so that a fresh record on one of the mandrels E' is brought into position below the reproducer L. I, also, provide means for locking the record carrier against movement, except when acted upon by the pawl and ratchet feed mechanism, which is moved at intervals by the arm T of the traveler J. In one form of my invention the locking mechanism consists of a disk U, which is fixed to the shaft B, said disk being provided with suitable openings indicated by dotted lines in Fig. 3. A spring arm U' is provided with a stud adapted to enter one of the openings of the disk U, and this arm is provided with a projection  $u$ , which is adapted to engage with a tooth of a star wheel  $u'$ , that is fixed to the shaft S. The tension of the arm U' normally impels the stud into one of the holes of the disk U, for the purpose of locking the shaft B of the record carrier against axial rotation, but when the shaft S is operated by the pawl and ratchet, as described, a tooth of the star wheel  $u'$  pulls on the projection  $u$  and the arm U', so as to withdraw the stud from the disk U, thus permitting the shaft S to turn the shaft B of the record carrier, as heretofore described.

The arm T<sup>2</sup> is shown as being divided and the outer part thereof is pivoted to the inner part, thus providing a jointed arm. When it is desired to make the reproducer travel a second time over the same record, and thereby repeat the reproduction of the musical or talking number, the operator should turn backward the outer part of this jointed arm, thus preventing the arm T<sup>2</sup> from operating the slide bar T of the mechanism

for automatically feeding the revoluble record carrier.

My machine is also equipped with a stop motion by which the operation of the reproducer may be arrested automatically at the end of the reproduction from each record, and also with a stop motion adapted for adjustment so as to automatically present every second, third or fourth record of the record carrier to a working position relative to the reproducer.

The stop device for arresting the machine at the end of the reproduction from each record is operated by the return of the reproducer carrier K to normal position. One member  $v$  of the motor or driving mechanism has a stud  $v'$ , see Fig. 6, and with this stud coöperates a stop lever V, hung on a bracket  $v^2$  within the casing A. To this lever is pivoted a link W, the upper end of which is pivoted to one arm of a lever X, fulcrumed on a fixed post  $x$ . The other end of the lever X has pivoted thereto a jointed arm Y, the member  $y$  of which is in the path of the reproducer carrier K. As this carrier is returned to its starting position, after completing its travel along the record, the end  $k$  of the carrier rides on the arm Y, so as to move the latter and thereby actuate the lever X so as to move the lever V through the link W, whereby the operation of the motor is arrested. Should it be desired to allow the machine to continue in operation, the pivoted member  $y$  of the arm Y is turned around so as to move it out of the path of the record carrier K.

In addition to the described stop motion, I also provide stop devices by which every second, third or fourth record may be used. A rock shaft Z is journaled in bearings or posts, and at its ends this shaft has arms Z', Z<sup>2</sup>. The arm Z<sup>2</sup> is connected by a pin  $z$  with the lever X for operating the latter when the shaft is rocked. Each arm  $c^3$  of the spider for the record carrier is provided with a pivoted finger  $z'$ , which is adapted to be turned to a position at right angles to the arm, as shown by full lines in Figs. 5 and 7, or to be turned to a position in line with the arm as indicated by dotted lines in Fig. 5. The arm Z' is adapted to lie in the path of the fingers  $z'$  when they lie at right angles to the arms  $c^3$  for the purpose of operating the arm Z', the rock shaft Z, the arm Z<sup>2</sup>, and the levers X and V to stop the motor. It is evident that the second, third, or fourth fingers  $z'$  may be adjusted out of position so as to clear the arm Z' and thus permit the other fingers to engage with said arm for operating the stop motion at the required intervals.

Changes in the form, size, proportion, and minor details in construction may be made without departing from the spirit of the in-

vention or sacrificing any of the advantages thereof, and I, therefore, reserve the right to make such alterations and modifications as fairly fall within the scope of my invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In an apparatus of the class described, a record carrier, a traveler for a reproducer, a shaft geared to the record carrier, a slidable member in the path of the traveler, a pawl carried by the slide, and a ratchet mounted on the shaft and cooperating with said pawl.

2. In an apparatus of the class described, a record carrier, a traveler for a reproducer, a shaft geared to the record carrier, means actuated by the traveler for rotating the shaft with a step by step motion, and means controllable by the shaft for locking the record carrier in the intervals of the feed given thereto by the shaft.

3. In an apparatus of the class described, feed and return screws, a slide rod, a reproducer traveler mounted to slide and turn on the rod and provided with arms, nuts carried by the arms for alternately engaging the screws, a collar on one end of the traveler and having limited turning movement independent of the traveler, said collar being provided with a weighted arm and with a finger, and a trip on each feed screw and adapted to engage the finger of the collar.

4. In an apparatus of the class described, feed and return screws, a slide rod, a reproducer traveler mounted to slide and turn on the rod and provided with arms, said traveler having a recess in one end, nuts carried by the arms for alternately engaging the screws, a collar loosely mounted on the traveler and having a stud working in the recess of the traveler, said collar being provided with a weighted arm and an arm carrying a finger, and a trip on each of the screws and adapted to engage the said finger.

5. In a machine of the class described, a record carrier provided with operating arms, means for operating the carrier, and means controllable by said arms for arresting the operating means.

6. In a machine of the class described, a record carrier provided with operating arms, means for operating the carrier, and means controllable by said arms for arresting the operating means, said operating arms being adjustable individually into and out of working position.

7. In a machine of the class described, a record carrier, means for operating the same, a reproducer carrier, a locking lever for arresting said operating means, another lever, a jointed arm connected with the last mentioned lever and adjustable relative to

the reproducer carrier, a rock shaft for operating the second lever, and means operated by the record carrier for rocking the shaft.

8. In an apparatus of the class described, a shaft, a reel mounted thereon and carrying a plurality of revoluble record supporting arbors, means for operating the shaft, an apertured disk on the shaft, a spring arm having a pin engaging the apertured disk, and a star wheel carried by the shaft operating means and engaging the spring arm to disengage it from the said disk.

9. In an apparatus of the class described, a motor having a stud on a movable member thereof, a multiple record carrier, a traveler, a reproducer carrier carried by the traveler, means for operating the traveler, an arm projecting into the path of the reproducer carrier, a pivoted stop lever adapted to be moved into the path of the stud of the movable member of the motor, and a connection between the pivoted stop lever and arm whereby the former will be operated by the latter.

10. In an apparatus of the class described, a record carrier, a motor, a traveler, a reproducer carrier carried by the traveler, means for operating the traveler, a pivoted arm projecting into the path of the reproducer carrier, a pivoted member adapted to be moved into the path of a movable member of the motor, means for operating said member from the arm, a shaft, a connection between the shaft and pivoted arm, and means for operating the shaft from the record carrier.

11. In an apparatus of the class described, a multiple record carrier, a reproducer carrier, means for operating the said carrier, a spring pressed slide, means for operating the multiple record carrier from the slide, and means for operating the slide from the reproducer carrier.

12. In an apparatus of the class described, a shaft, a plurality of revoluble record supporting arbors on the shaft, means for operating the shaft, a member carried by the shaft, a spring arm having interlocking engagement with the member, and a member carried by the shaft operating means for disengaging the spring arm from the first named member.

13. In an apparatus of the class described, a multiple record carrier, a reproducer carrier, means for operating the reproducer carrier, a spring pressed member, means for operating the multiple record carrier from the said member, and means for operating the member from the reproducer carrier.

14. In an apparatus of the class described, a multiple record carrier, means for operating the said carrier to bring the records in proper position, a rocking reproducer carrier, means for rocking said carrier, a feed



device for said carrier, controlled by the  
rocking movement thereof, means controlled  
by the reproducer carrier for stopping the  
apparatus at the end of the reproduction of  
5 each record, and means controlled by the  
record carrier for stopping the apparatus to  
permit of bringing any one of the records  
into working position.

In testimony whereof I have signed my  
name to this specification in the presence of 10  
two subscribing witnesses.

RICHARD B. SMITH.

Witnesses:

H. I. BERNHARD,  
V. E. NICHOLS.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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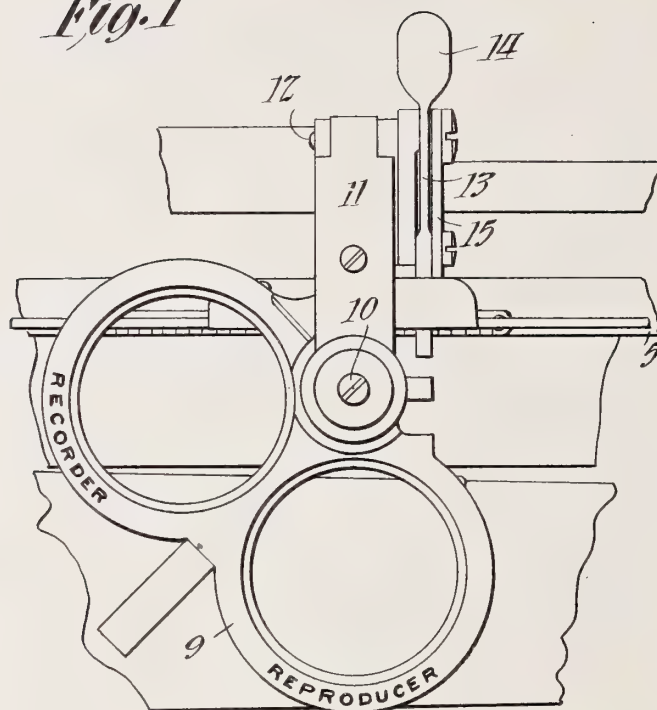
C. L. HIBBARD.  
 PHONOGRAPH.  
 APPLICATION FILED JULY 31, 1909.

1,023,250.

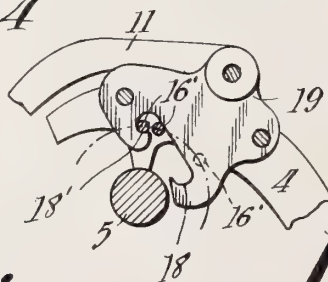
Patented Apr. 16, 1912.

2 SHEETS—SHEET 1.

*Fig. 1*



*Fig. 4*



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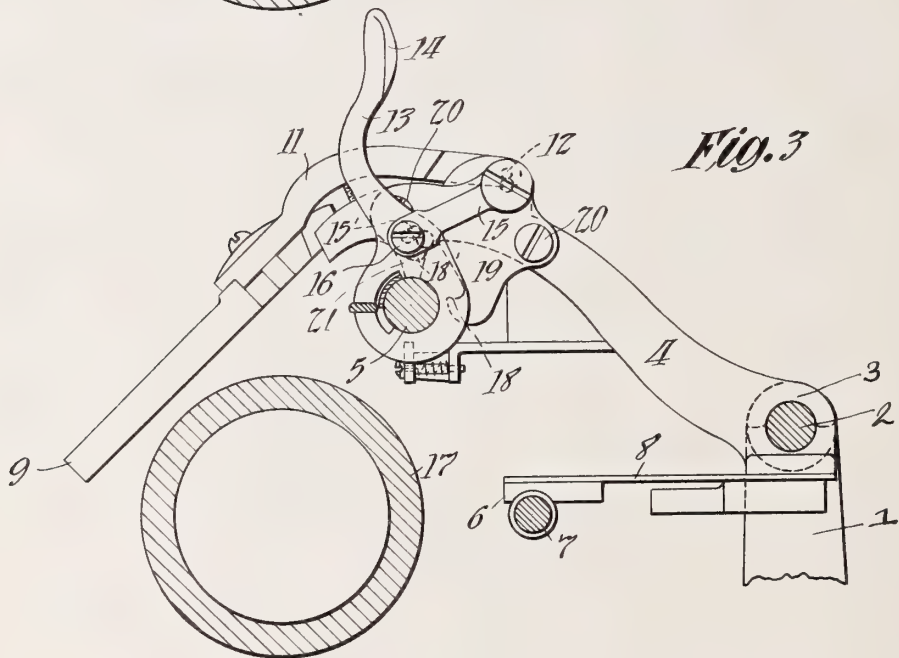
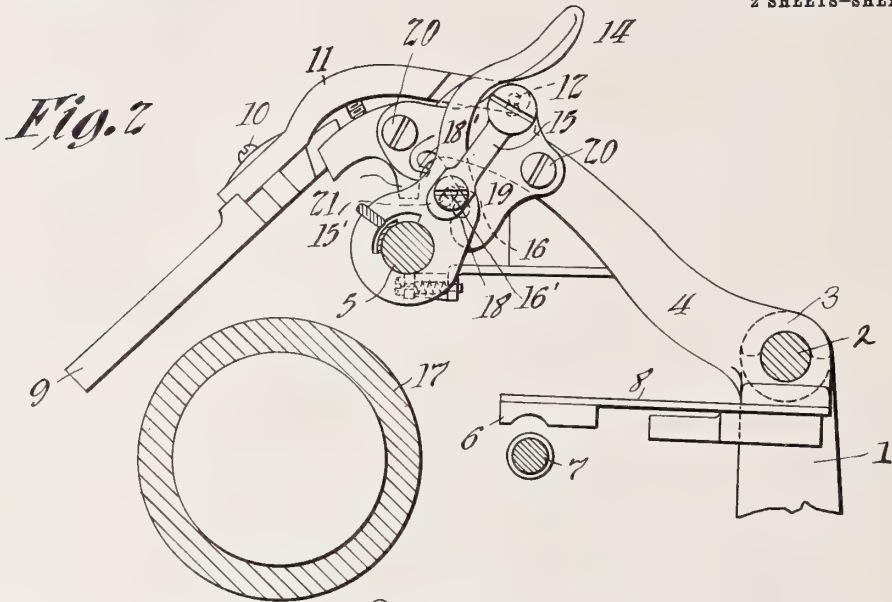




1,023,250.

Patented Apr. 16, 1912.

2 SHEETS—SHEET 2.



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 by Frank L. Byer  
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# UNITED STATES PATENT OFFICE.

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## PHONOGRAPH.

1,023,250.

Specification of Letters Patent.

Patented Apr. 16, 1912.

Application filed July 31, 1909. Serial No. 510,595.

*To all whom it may concern:*

Be it known that I, CHARLES L. HIBBARD, a citizen of the United States, and a resident of East Orange, in the county of Essex and State of New Jersey, have made a certain new and useful Invention in Phonographs, of which the following is a description.

My invention relates to phonographs and more particularly to phonographs of the general type shown in United States Patent No. 772,485, granted October 18, 1904 to Weber and Hibbard.

My invention has for its object the provision of improved means for raising and lowering the arm which carries the reproducer or recorder or both. This arm is lowered to bring the reproducer or recorder stylus into contact with the record and is raised to remove the same therefrom in order that the record may be changed.

By my invention a simple and effective lifting device is provided, which is self-locking in each of its extreme positions, and which is thrown by gravity into either extreme position without the necessity of using springs.

My invention also comprises certain other details of construction which will be hereinafter fully set forth.

Referring to the accompanying drawings disclosing one embodiment of my invention, Figure 1 represents a plan view of a portion of a phonograph equipped with my invention. Fig. 2 is an end elevation of so much of a phonograph as is necessary to disclose my invention, the carrier arm being shown in raised position. Fig. 3 is a similar view of the carrier arm, the same being shown in lowered position, and Fig. 4 is a detail view showing the various positions of the stop and locking pin on the lifting arm corresponding to the movements of the latter.

Referring to the drawings, the standard 1 of the phonograph which rises from a suitable base plate (not shown) carries the back rod 2 on which is mounted the sleeve 3, the carrier arm 4 being integral therewith or secured thereto. Parallel with the back rod 2 is the front guide rod 5 which is adapted to support the forward end of the carrier arm 4. The feed nut 6 engages the feed screw 7 when the carrier arm 4 is in lowered position and is disengaged therefrom when the carrier arm is in raised position, the feed

nut 6 being carried by the usual feed nut spring 8. The spectacle frame 9, which is adapted to carry a recorder and a reproducer, is pivotally mounted on the stud 10, the spectacle frame being thus mounted to so rotate that either the recorder or reproducer may be placed in operative position. The screw or stud 10 is carried by the auxiliary arm 11 which is pivoted on the pin 12 carried by the carrier arm 4. All these parts are of usual construction. It is to be understood, however, that my invention need not be applied to a phonograph employing both a recorder and a reproducer, but that it may be used for lifting the carrier of a phonograph equipped with both or either of these devices.

The lifting lever 13 is rotatably and slidably mounted upon the forward guide rod 5, this lever being preferably provided with a passageway through the lower end thereof through which the said guide rod 5 passes. The lever 13 is provided with a handle 14 for manipulation of the same. A link 15 is pivotally connected to the lever 13 by means of screw or pin 16, and is pivotally connected to the carrier arm 4 by the pin 12 already referred to, link 15 being mounted for free rotation around both pins 12 and 16. By this construction, a toggle joint is provided, the central point of which is the stud 16 and the two arms are the link 15 and the portion of the lever 13 between the rod 5 and the stud 16 respectively. By forcing the handle 14 to the right, as shown in Figs. 2 and 3, the toggle is straightened out and the carrier arm raised, the stylus being raised out of its engagement with the record 17, while by movement of the handle 14 to the left, the toggle is opened out and the stylus lowered into engagement with the record. The lever 13 is stopped in its extreme movement to the right, as shown in Fig. 2, by the engagement of pin 16', which is carried on the back of lever 13, against the projection 18 of the bracket 19 which is secured to the carrier arm 4 by means of screws 20, 20. The lug 21 is provided upon the lower side of the carrier arm to contact the upper side of guide rod 5 when the carrier arm is in its lowered position, thus stopping the forward movement of the lever 13 and forming a support for the carrier arm when in its lowered position.

The bracket 19 is formed, as shown in Figs. 2, 3 and 4, with a guideway in which the pin 16' travels, the hook 18 forming a stop for the pin at the extreme movement of the lever 13 to the right, as shown in the drawings, and the hook 18' being formed at the extreme left of the guideway. The link 15 is provided preferably with a slot 15' in which the pin 16' has a certain amount of lost motion. The object of the provision of this lost motion is that when the lever 13 is in its extreme left hand position, as shown in Fig. 3, the pin 16' may be carried into locking engagement with the hook 18'. When the lever 13 has been carried so far to the left in lowering the stylus into contact with the record that the stop 21 on arm 4 contacts rod 5, thus limiting the downward movement of arm 4, the pin 16' is in the middle position of the three illustrated in Fig. 4. The slot 15', however, permits the lever 13 to move a slight additional distance to the left, during which pin 16' moves from the position referred to, which is opposite the nose of hook 18', to the extreme left position shown, in which hook 18' is beneath the same. This locks arm 4 against any upward movement which otherwise might ensue on raising the spectacle frame about its pivot 12 in shifting the recorder or reproducer from operative into inoperative position.

It is to be noted that the parts are so arranged that the center of gravity of the lever 13 is to the left of rod 5 upon which the lever is mounted when the carrier arm is in its lowered position, and to the right of the axis of guide rod 5 when the carrier is in its raised position, the lever 13 moving to either extreme position by gravity when the center of gravity of the lever 13 passes over the center line of guide rod 5. It should also be noted that the carrier arm is locked in both positions because of the straightening out of the toggle when the parts are in raised position, and the locking of pin 16' by hook 18' when the parts are in lowered position.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. In a phonograph, the combination with the carrier arm and the rod upon which it

is pivotally mounted, of a lift lever for said arm, a rod parallel to said first named rod, upon which said lever is pivotally mounted, and a link pivoted to said arm and lever, said link and lever constituting a toggle joint, substantially as described.

2. In a phonograph, the combination with the carrier arm and the back rod upon which it is pivotally mounted, of a front rod parallel to said back rod, a lever pivotally mounted upon and embracing said front rod, and a link pivotally connected to said arm and lever, said link and lever constituting a toggle joint, substantially as described.

3. In a phonograph, the combination with the pivotally mounted carrier arm, of a toggle for raising and lowering said arm, said toggle comprising a plurality of pivotally connected members, one pivoted to said arm and the other to a fixed part of the machine, substantially as described.

4. In a phonograph, the combination with the pivotally mounted carrier arm, of a toggle for raising and lowering said arm, and stop means for limiting the pivotal movement of said arm, said toggle comprising a plurality of pivotally connecting members, one pivoted to said arm and the other to a fixed part of the machine, substantially as described.

5. In a phonograph, the combination with the carrier arm and the back rod upon which it is pivotally mounted, of a front rod parallel to said back rod, a lever pivotally mounted upon and embracing said front rod, at the lower end of said lever, and a link pivotally connected to said arm and lever above said front rod, said link and lever constituting a toggle joint, said toggle straightening out to lift said arm and opening to lower it, and the pivotal connection of said link to said lever being so placed as to pass across the axis of said front rod in the movement of said toggle from one extreme position to the other, substantially as described.

This specification signed and witnessed this 29 day of July 1909.

CHARLES L. HIBBARD.

Witnesses:

JOHN M. CANFIELD,  
ANNA R. KLEHM.



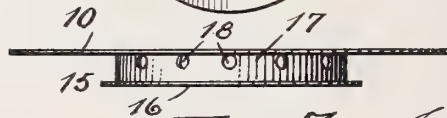
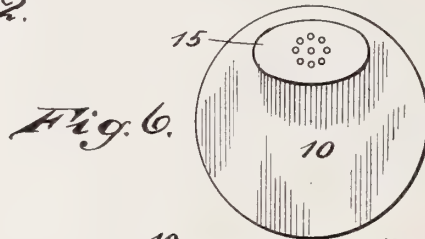
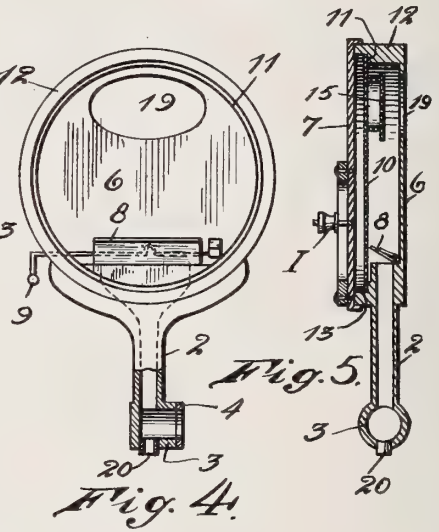
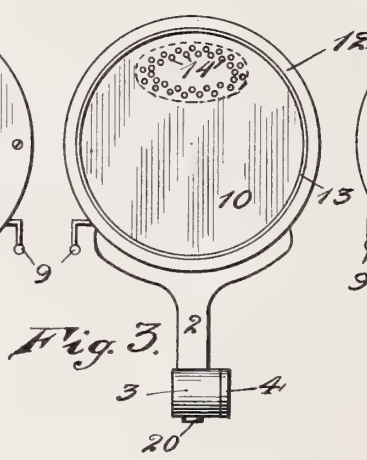
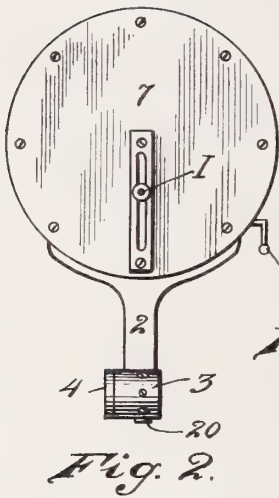
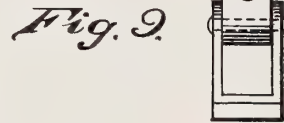
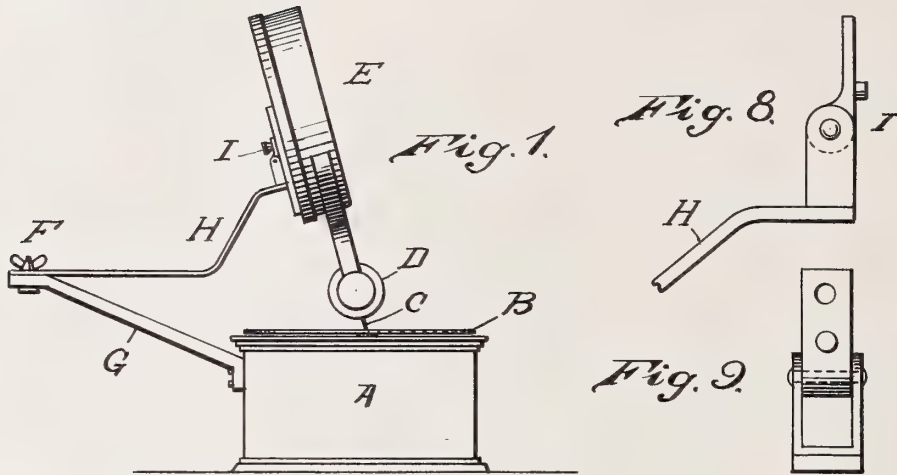




J. D. BARTER.  
ATTACHMENT FOR PHONOGRAPHS AND LIKE MACHINES.  
APPLICATION FILED JUNE 29, 1911.

1,023,544.

Patented Apr. 16, 1912.



Inventor

Witnesses

J. Milton Jester.  
C. C. Brady

Fig. 7. John D. Barter

By

John S. Barter  
his Attorney

# UNITED STATES PATENT OFFICE.

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OF NEW YORK, N. Y.

## ATTACHMENT FOR PHONOGRAPHS AND LIKE MACHINES.

1,023,544.

Specification of Letters Patent.

Patented Apr. 16, 1912.

Application filed June 29, 1911. Serial No. 636,006.

*To all whom it may concern:*

Be it known that I, JOHN D. BARTER, a citizen of the United States, residing at New York city, in the county and State of New York, have invented certain new and useful Improvements in Attachments for Phonographs and Like Machines, of which the following is a specification.

My invention relates to an attachment adapted to be used in connection with a phonograph or other similar sound reproducing machine and has for its object to produce an instrument that will amplify the sounds reproduced from the record and which shall accomplish this without impairing the timbre and tone qualities of the record being translated, a defect that is common to amplifying horns such as are usually employed in connection with sound reproducing machines; and which often renders their use, especially in parlors and small apartments, objectionable.

The invention will be hereinafter described and is illustrated in its preferred form in the accompanying drawings, wherein—

Figure 1 is a side view of an instrument embodying my invention applied to a sound reproducing or talking machine of a well-known type. Fig. 2 is a rear elevation of the attachment. Fig. 3 is a front elevation of the same, the front wall of the casing being removed. Fig. 4 is a similar view to Fig. 3 with the sounding board removed and parts being in section. Fig. 5 is a longitudinal sectional view through the complete attachment. Fig. 6 is an elevation of the sounding board detached. Fig. 7 is an edge view of the sounding board drawn to a larger scale. Figs. 8 and 9 are detached views of the support for the attachment.

In the accompanying drawings A designates the casing of a talking machine, provided with mechanism for supporting and revolving a record B, with which engages the stylus C, connected with the sound box D. These parts may be of any usual or approved construction as they form no part of my invention, which is adapted to be used in connection with talking machines of a wide variety of styles.

The instrument which constitutes my invention is, as a whole, designated E, and takes the place of the amplifying horn usu-

ally employed with talking machines. It is supported from a rocking or swivel support F mounted in a bracket G, extending from the casing A, by means of an arm H, which has an adjustable connection I with the casing of the instrument E. This instrument consists essentially of a hollow casing in which is mounted a sounding board, and a tubular stem or sound-conducting tube uniting the casing with the sound box D. This tubular stem is designated 2 and is preferably straight, with an offset 3 at its end, adapting it to be readily attached to the tubular stud with which the sound box D is provided. A packing 4 of rubber, felt, or other suitable material, is provided at the end of the offset 3 for the better connection with the stem of the sound box. The stem 2 opens into a hollow casing, which is preferably a shallow box approximately circular in outline and closed by end walls 6 and 7, one of which is preferably removable. The opening from the stem into the casing is preferably controlled by a gate or valve 8, adapted to be operated from the outside, by a handle 9. By means of this valve the volume of the sound entering the casing from the sound box D may be regulated. Within the casing 5 there is mounted a sounding board 10, which I prefer to form of thin and resonant wood. It is preferably seated upon a narrow ledge or seat 11 formed in or carried by the rim 12 of the casing and is held in place by a clamping ring 13. I have found that the volume of the tones reproduced by the sounding board is increased if the latter has formed in it a number of perforations 14, and that the best effects are produced if these are located in a group situated between the center of the board and its periphery. I have also discovered that the clearness of the tones reproduced and their beauty is increased if there is attached to one face of the sounding board, surrounding or covering the apertures 14, a cell 15, which is preferably formed of thin wood like the sounding board, and consisting of a small perforated plate 16, supported at a short distance from, and substantially parallel with, the sounding board, by a wooden rim 17 which is also preferably perforated, as indicated at 18.

In one wall of the sound casing 5, which itself is formed of rigid, resonant material,

there is an opening 19 opposite the cell 15, and approximately the size of the outline of the latter.

I have also found that the quality of the tones produced by my instrument is improved if the hollow stem be open at both ends, at one end into the casing carrying the sounding board, as described, and at the other end into the open air, as indicated at 20. This latter opening need not be large, but is important. The stem when thus constructed constitutes an open sounding tube communicating with the tone-producing devices at one end and with the sounding board chamber at the other.

When an instrument such as I have described is applied to a sound-reproducing or talking machine, as indicated in Fig. 1, the reproduced sounds are amplified, but not to an undesirable degree, and are found to have, to a remarkable extent, the timbre of the original sound recorded. The sounds are very clearly reproduced and the harsh, grating and metallic sounds, so often incident to the use of talking machines are reduced to a minimum, or even entirely eliminated.

What I claim is:

1. The combination with the sound box of a sound reproducing machine, of a casing containing a perforated sounding board and a tubular connection between the casing and the sound box open at one end into the casing and at the other into the atmosphere.

2. The combination with the sound box of a talking machine, of a casing inclosing a perforated sounding board, a cell carried by the board and inclosing the perforations, and a tubular connection between the casing and the sound box, and open at one end into the casing and at the other end into the atmosphere.

3. The combination with the sound box of a talking machine, of a casing inclosing a sounding board having a series of openings adjacent one edge, and a cell carried by the board and inclosing the openings therein.

4. The combination with the sound box of a talking machine, of a casing containing a sounding board in which are formed a number of perforations, arranged in a group located between the center of the board and its periphery, a tubular connection between the sound box and the casing, and a cell attached to the sounding board and inclosing the perforated portion thereof.

5. The combination with the sound box of a talking machine, of a casing containing a perforated sounding board, a tubular con-

nection between the sound box and the casing, and a cell attached to the sounding board and inclosing the perforated portion thereof.

6. The combination with the sound box of a talking machine, of a casing containing a sounding board in which are formed a number of perforations, arranged in a group located between the center of the board and its periphery, a tubular connection between the sound box and the casing, and a cell attached to the sounding board and covering the perforations therein.

7. The combination with the sound box of a sound reproducing machine, of a casing of rigid resonant material, a sounding board supported therein, the board being perforated, a cell attached to the sounding board and covering the perforated portion thereof, consisting of a thin perforated plate substantially parallel with and a short distance from the face of the sounding board, and a rim uniting the said plate with the sounding board, and a tubular connection between the casing and the sound box.

8. The combination with the sound box of a sound reproducing machine, of a casing of rigid resonant material, a sounding board supported therein, the board being perforated, a cell attached to the sounding board and covering the perforated portion thereof, a tubular connection between the casing and the sound box open at both ends, at one to the atmosphere and at the other into the casing, and a valve controlling the opening between the tubular connection and the casing, the wall of the casing opposite the cell being perforated.

9. The combination with the sound box of a sound reproducing machine, of a casing, a sounding board supported therein and having a series of openings therein, a cell attached to the sounding board and covering the perforated portion thereof, and a tubular connection between the casing and the sound box.

10. The combination with the sound box of a reproducing machine, of a casing, a sounding board supported therein and having a series of openings therein, a cell attached to the sounding board and covering the perforated portion thereof, the casing having an opening opposite the cell, and a tubular connection between the casing and the sound box.

JOHN D. BARTER.

Witnesses:

JOHN S. BARKER,  
GEO. B. PITTS.







1,024,034.

Patented Apr. 23, 1912.

4 SHEETS-SHEET 1.

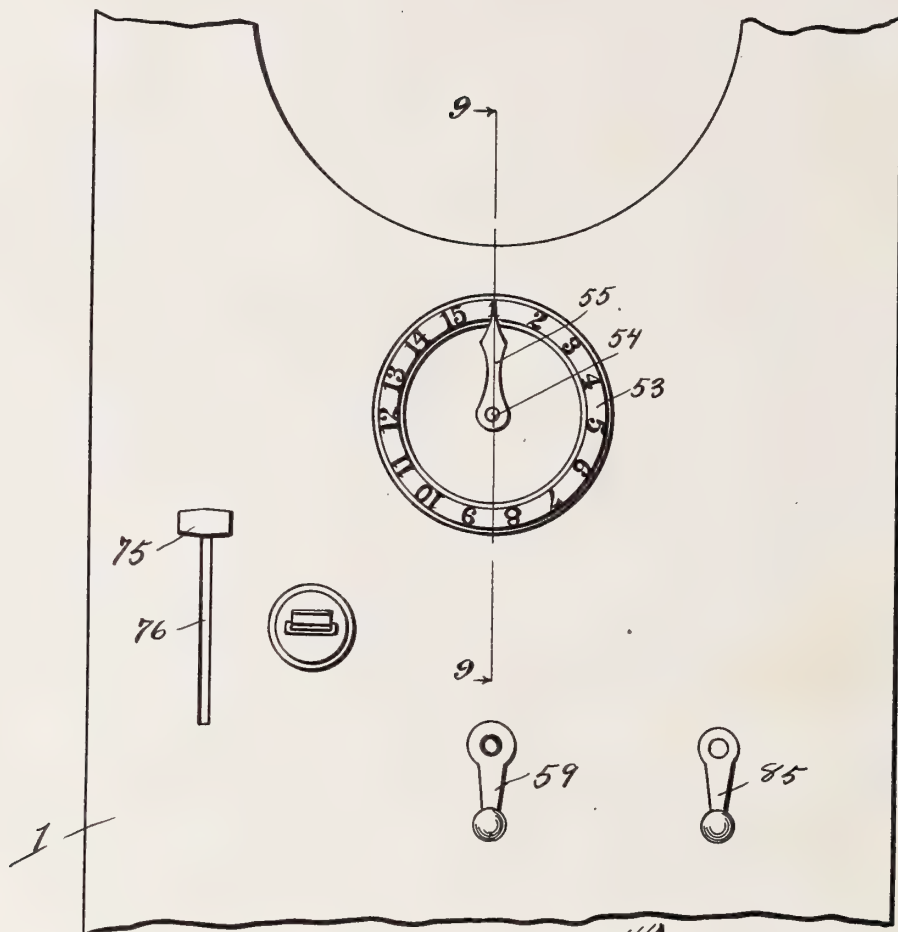


Fig. I.

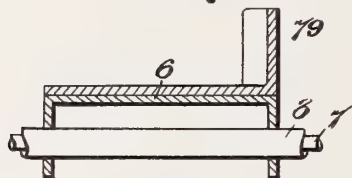
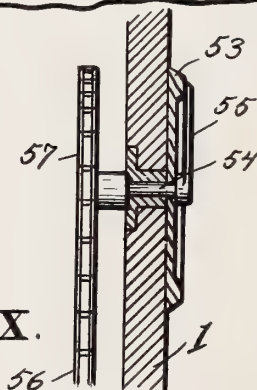


Fig. VIII

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 Luella G. Greenfield

Fig. IX.



Inventor

By

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Attorneys



C. C. SHIGLEY.

PHONOGRAPH.

APPLICATION FILED DEC. 2, 1910.

Patented Apr. 23, 1912.

4 SHEETS-SHEET 2.

1,024,034.

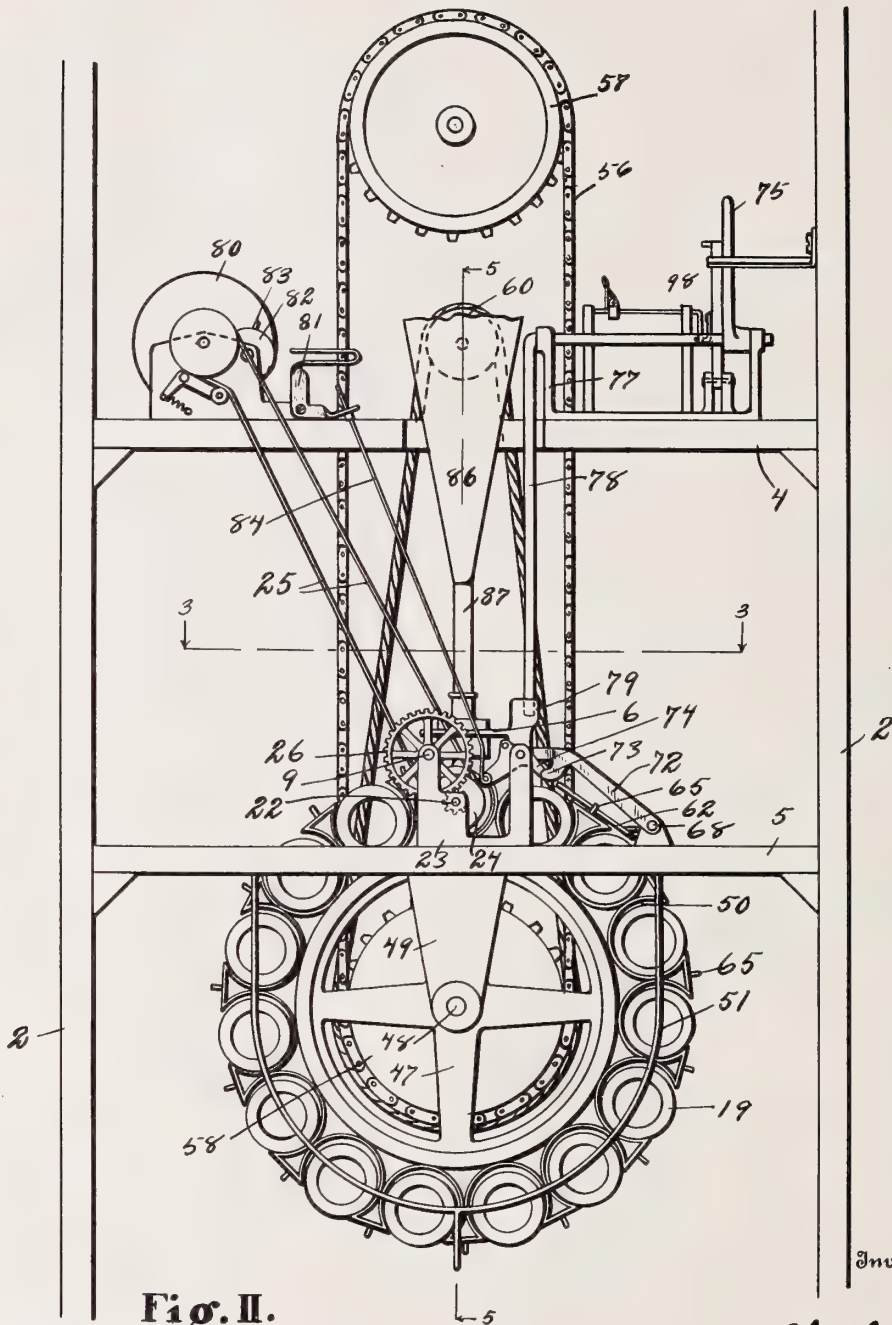


Fig. II.

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334

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PHONOGRAPH.

APPLICATION FILED DEC. 2, 1910.

Patented Apr. 23, 1912.

4 SHEETS-SHEET 3.

1,024,034.

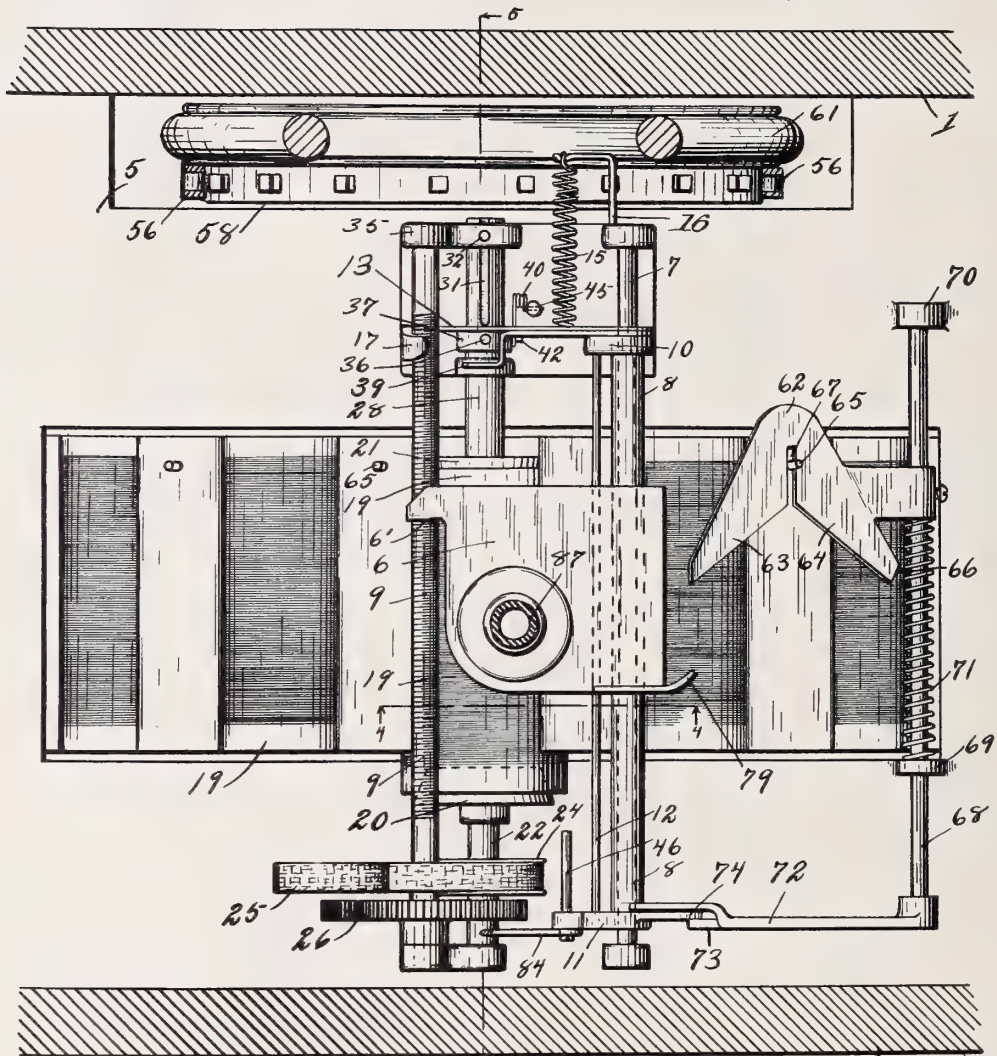


Fig. III.

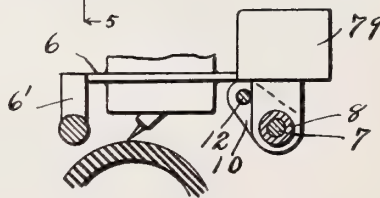


Fig. IV.

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Witnesses  
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PHONOGRAPH.

APPLICATION FILED DEC. 2, 1910.

1,024,034.

Patented Apr. 23, 1912.

4 SHEETS—SHEET 4.

Fig. VI.

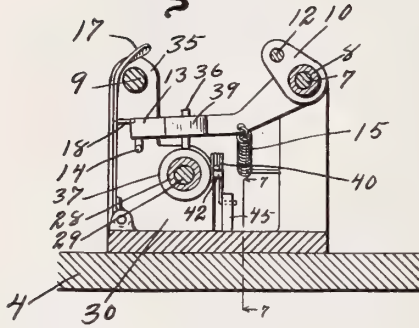


Fig. VII.

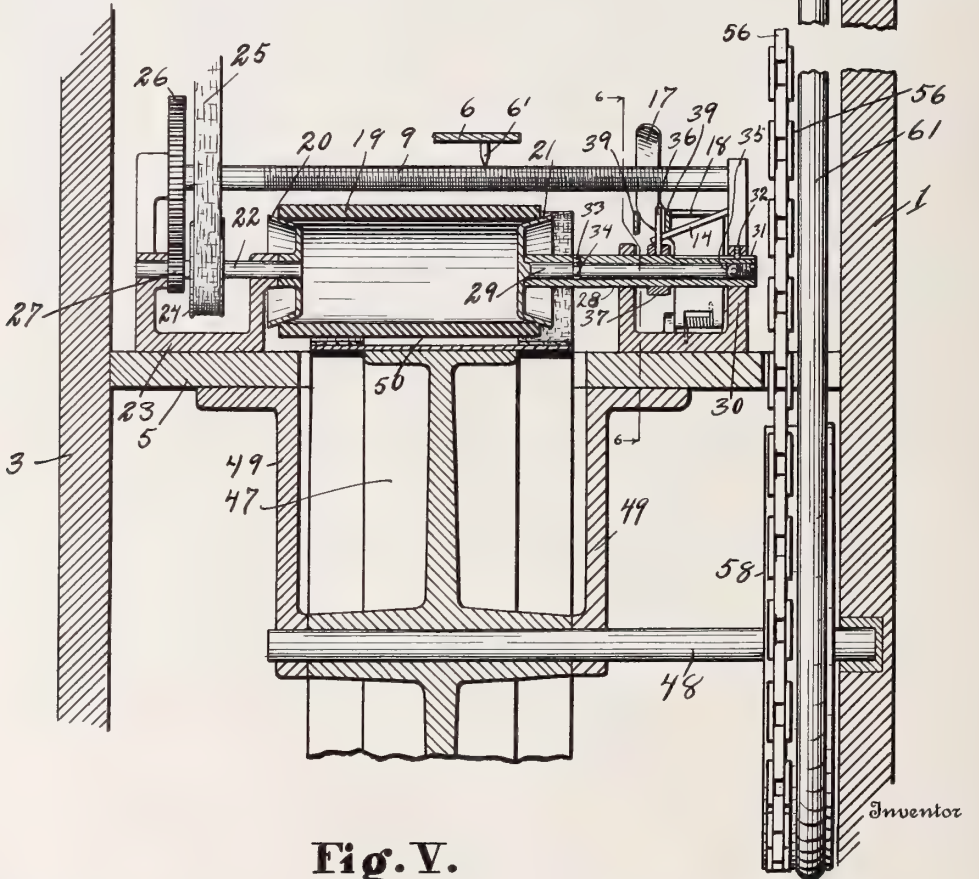
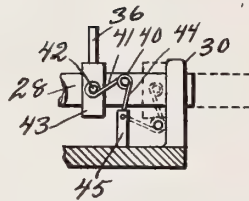


Fig. V.

Witnesses

Margaret L. Glasgow.  
Luella E. Greenfield

By

Cyrus L. Shigley  
Chapman & Co. Attorneys



# UNITED STATES PATENT OFFICE.

CYRUS C. SHIGLEY, OF GRAND RAPIDS, MICHIGAN, ASSIGNOR OF ONE-HALF TO  
PATRICK McLAUGHLIN, OF GRAND RAPIDS, MICHIGAN.

## PHONOGRAPH.

1,024,034.

Specification of Letters Patent.

Patented Apr. 23, 1912.

Application filed December 2, 1910. Serial No. 595,283.

*To all whom it may concern:*

Be it known that I, CYRUS C. SHIGLEY, a citizen of the United States, residing at the city of Grand Rapids, county of Kent, State of Michigan, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

This invention relates to improvements in phonographs.

- 10 The main objects of this invention are: First, to provide in a phonograph an improved control mechanism for the various coating parts. Second, to provide in a phonograph an improved carriage control.
- 15 Third, to provide in a phonograph an improved record driving mechanism. Fourth, to provide in a phonograph an improved record magazine. Fifth, to provide in a phonograph an improved magazine lock and adjusting mechanism therefor. Sixth, to provide an improved magazine phonograph, which is simple and compact in structure and easily operated, and, further, one which is not likely to be broken by an unskilled
- 20 operator or to get out of repair in use.

Further objects, and objects relating to structural details, will definitely appear from the detailed description to follow.

- 30 I accomplish the objects of my invention by the devices and means described in the following specification.

- The structure described constitutes one effective embodiment of my invention. Other embodiments would be readily devised by
- 35 those skilled in the art.

The invention is clearly defined and pointed out in the claims.

- A structure constituting an effective and preferred embodiment of the features of my invention is clearly illustrated in the accompanying drawing, forming a part of this specification, in which:
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- Figure I is a detail front elevation of a structure embodying the features of my invention, the operating parts on the outside of the casing only being shown. Fig. II is a rear elevation of the magazine and operating mechanism of my improved phonograph. Fig. III is a horizontal section, taken on a line corresponding to line 3—3 of Fig. II, the control lever being omitted.
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Fig. IV is a detail vertical section, taken on a line corresponding to line 4—4 of Fig. III, showing details of the sound-box carriage. Fig. V is a detail vertical section, taken on a line corresponding to line 5—5 of Fig. III. Fig. VI is a detail vertical section, taken on a line corresponding to line 6—6 of Fig. V, showing details of the control mechanism. Fig. VII is a detail section, taken on a line corresponding to line 7—7 of Fig. VI. Fig. VIII is a detail view partially in section, showing structural details of the carriage 6. Fig. IX is an enlarged detail section taken on a line corresponding to line 9—9 of Fig. I showing details of the index.

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In the drawings, similar reference characters refer to similar parts throughout the several views, and the sectional views are taken looking in the direction of the little arrows at the ends of the section lines.

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Referring to the accompanying drawing, I illustrate only parts of the casing to show the supports for the operating mechanism. The casing and frame shown comprise a front wall 1, side walls 2, rear wall 3, and horizontally-disposed pieces 4 and 5. The sound-box carriage 6 is provided with a way and control mechanism, preferably consisting of the rod 7 on which is mounted, for longitudinal and rocking movement, a control member 8. The carriage 6 is slidably mounted on this member 8. The feed screw 9 is arranged parallel with the carriage way, the carriage being provided with a screw-engaging member 6'. The control member 8 is adapted to be rocked on the rod 7 to lift the carriage from engagement with the screw. This lifting means consists of arms 10 and 11 on the sleeve by which the rod 12 is carried, the rod being arranged to engage the under side of the carriage,—see Figs. III and IV. On the control member 8 is an arm 13, which rides up on the inclined pin 14 when the control member is shifted to its initial position, thus rocking it. The carriage control 8 is returned to its initial position by means of the spring 15, one end of which is connected to the arm 13 and the other to a supporting arm 16. This spring is so connected to the control member that

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it also serves to hold it yieldingly in its forward position.

When the parts are in the position shown in the drawings, the control member is 5 rocked forwardly to bring the carriage into engagement with the feed screw. The control member is retained in this position by means of the catch 17, which is provided with an engaging portion 18 adapted to en- 10 gage the arm 13,—see Figs. V and VI. The catch 17 is released by the carriage when it reaches the end of its movement, and, when released, the spring 15 shifts the control member, and, as stated, the arm 13, riding 15 up on the inclined member 14, rocks the control member and lifts the carriage from the feed screw and also the sound-box from the record.

The records, as 19, are supported and 20 driven in proper relation to the reproducer by means of a pair of mandrel members 20 and 21, which are adapted to engage the ends of the cylindrical records, as clearly illustrated in the drawings. The mandrel 25 member 20 is a driven member, its shaft or spindle 22 being mounted in a suitable bearing bracket 23 on the frame piece 5. On the shaft or spindle 22 is a belt pulley 24, for the motor belt 25. The feed screw 9 is con- 30 nected to the shaft 22 by means of the gears 26 and 27. The mandrel member 21 is mounted for longitudinal adjustment. The bearing 28 for the shaft or spindle 29 of the mandrel member 21 is slidably mounted in 35 the bearing bracket 30, mounted on the plate or frame piece 5. The bearing 28 is preferably sleeve-like or tubular, and is provided with a longitudinal groove 31, with which the screw 32 engages to prevent its turning. 40 The spindle 29 is retained in the bearing by means of the screw 33, which engages the annular groove 34 in the spindle. A thrust bearing ball 35 is preferably provided for the end of the spindle.

The mandrel member 21 is shifted to en- 45 gage and release the records by the control member 8. The means by which this is accomplished in the structure illustrated consists of the tappet pin 36 carried by the 50 collar 37 on the bearing 28. This tappet pin is arranged to be engaged by the arm 13 and by the tappet 39, carried by the arm, so that, when the control member is shifted to the position shown in the drawing, the 55 mandrel member is engaged with the record to pick the same up from the holder or magazine and properly support it in relations to the carriage. When the control member is shifted to its initial or carriage 60 disengaging position, the tappet 39 engages the pin and disengages the mandrel member from the record. To hold the mandrel member yieldingly in engagement with the record under spring tension, I provide a coiled

spring 40, the arm 41 of which is connected 65 to the pin 42 on the collar 43, while the other arm 44 of the spring is connected to the stud 45 on the frame. The spring, thus supported and connected, serves to hold the mandrel member 21 in both positions,—that 70 is, the spring is thrown past the center by means of the control member 8, and, when thus shifted, acts in both directions.

To insure the disengaging of the record from the mandrel member 20, I preferably 75 provided a tappet 46, adapted to engage the record supported by the mandrel when the control member 8 is returned.

The magazine illustrated consists of the wheel 47, carried by the shaft 48, mounted 80 in suitable hangers 49, depending from the frame piece 5,—see Fig. IV. The magazine is provided with a plurality of record holders 50, which are preferably formed in- 85 tegrally of a strip of sheet metal, bent into a series of cylindrical loops, the holders being open at their ends to allow the records to be picked up by the mandrel member, and being open on their outer sides to per- 90 mit the records being engaged by the sound-box stylus, as it is carried along by the carriage. The holders support the records loosely, so that they can be shifted longi- 95 tudinally therein and picked up and driven by the mandrels without engaging the walls of the holders while being so driven.

In loading the magazine, the records are simply slipped into the holders, the only care required being to make sure that they are in 100 right end to. Guards 51, formed of curved wires, are preferably provided for the ends of the holders. These guards hang from the frame piece 5, and are positioned so that the holders revolve between them as the 105 magazine is revolved.

The magazine is provided with an index 110 dial 53, arranged on the front of the casing, as illustrated. The shaft 54 of the index hand 55 is connected by the chain 56 and the sprocket wheels 57 and 58 to the shaft 48 on 115 the magazine, so that, as the magazine is revolved, this index hand is revolved. The magazine is revolved preferably by means of the crank 59, which is provided with a pulley 60 for the belt 61, which engages the 120 pulley 58 on the magazine shaft 48. This belt connection is preferred, as it provides a simple driving means permitting slippage in the event that the crank should be turned while the magazine is locked so that no in- jury results.

The magazine is locked in playing position, and is preferably brought into proper playing position, relative to the sound-box, 125 by means of a locking member 62. The member 62 is substantially A-shaped, it being provided with a pair of diverging arms 63 and 64, adapted to engage the pins 65 on

the magazine. These pins 65 are placed at uniform distances around the magazine, there being a pin for each record holder. The distance between the points of the arms 63 and 64 is slightly less than the distance or space between the pins,—so, that, it is impossible for the locking plates to engage two pins at the same time. The arm 64 is preferably provided with an inclined pin-engaging surface 66, which, should it engage one of the pins, is adapted to shift the magazines slightly, so as to bring one of its pins between the arms. The arm 64 is somewhat longer than the arm 63. As the distance between the outer end of this inclined pin-engaging surface and the point of the other arm is greater than the distance between the pins, the lock is always sure to engage one pin and to swing the magazine into operative position.

The locking member 62 is preferably provided with a slot 67 at the apex, adapted to receive a pin, and, when a pin is engaged in this slot, the magazine is locked in position. The locking member 62 is mounted on the longitudinally movable rod 68, carried by the bearing members 69 and 70. A spring, which is preferably arranged on the rod between the bearing member 69 and the member 62, shifts the locking member to its inoperative position. The rod 68 is provided with an arm 72, having a catch 73 thereon coacting with the catch 74 on the control member 8. When the control member is in the position shown in the drawings, the catches 73 and 74 engage and the locking plate is retained in position. When the control member is rocked to disengage the carriage, these catches are disengaged and the locking member released and is returned to its inoperative position by means of the spring 71.

The locking member is shifted to its locking or engaging position on the setting of the carriage. The carriage is set or shifted, and also the control member is shifted to the position shown in the drawings, by means of the actuating lever 75, one end of which projects through the slot 76 in the front wall of the casing. This lever is mounted in a bearing 77 and provided with a downwardly-projecting arm 78, adapted to engage the projection 79 on the carriage, so that, when the lever is thrown downwardly, the carriage is thrown over to its starting position, and also the control member is shifted and the locking plate 62 actuated, the arm 72 of the locking plate being positioned to be engaged by the arm of the carriage. The control member 8 also serves to control the motor 80, which is shown mainly in conventional form. The motor is preferably mounted on the upper frame piece 4. The motor control dog 81, shown

in its disengaged position in Fig. 2, coacts 65 with the stop wheel 82, having a stop pin 83 thereon. The dog 81 is connected by the rod 84 to the arm 11 on the control member 8, so that, when the control member is actuated to bring the carriage to its playing position, the motor is released, and, at the end of the movement of the carriage, the motor is stopped automatically. The motor crank 85 is preferably arranged on the front wall of the casing, as shown in Fig. 1.

Only a portion of the horn 86 is illustrated, as it forms no part of this invention. It is connected by a suitable flexible connection, as 87, to the sound-box.

The setting or actuating lever 75 is provided with a coin control mechanism, the details of which are not described as claims to such features have been withdrawn from this application. I will now describe the operation of my improved machine.

The machine is first adjusted to bring the desired record into playing position and this is indicated by the index described. The actuating lever 75 is then forced downwardly and the arm 78 thereof engages the projection 79 on the carriage 6 and sets the carriage. This same movement through the connections described actuates the magazine locking member 62, bringing the record to the exact reproducing position, as well as locking the magazine in that position. This movement also, through the connections described, namely, the tappet members on the carriage control member and the coacting tappet member on the movable mandrel member, engages the mandrels with the record, picking the record up from the magazine. The control member is actuated against the tension of the spring 15 and is engaged in its set position by the catch 17. The control member is shifted to its set position by the setting of the carriage which engages the left-hand end of the control member toward the end of the setting stroke. As the control member is moved forward, the arm 13 thereon sliding on the inclined pin 14 rocks the control member forwardly and permits the carriage to engage with the feed screw and brings the reproducer into operative engagement with the record when the carriage reaches its set position. This forward rocking movement of the carriage control member through the connection described releases the motor. The carriage is driven by its feed screw until the carriage engages and releases the catch 17, when the spring 15, acting on the control member, carries it to its initial position. During this movement, the arm 13 sliding on the pin 14 rocks the control member rearwardly to disengage the carriage, and through the tappet connection described, the record is released as well as the



magazine locked. Also the motor is stopped. This completes the cycle of movement.

By arranging the parts as I have illustrated and described, I secure a mechanism which is adapted for the common form of cylindrical phonograph records, without special adaption thereof. The records can be easily inserted or removed from the magazine, as desired. The mechanism is entirely automatic, except for winding of the motor and the actuating of the control lever. The mechanism is so arranged that there is little liability of the parts being injured by an inexperienced operator. The structure is compact, and is comparatively simple and economical to produce.

I have illustrated and described my improvements in a practical embodiment. I desire to remark, however, that I have in mind various modifications in structural details and various modifications will, no doubt, suggest themselves to those skilled in the art to which this invention relates. I have not, however, attempted to illustrate or describe the various modifications, as that seems unnecessary to the proper illustration of my invention. I desire to be understood, however, as claiming my invention not only specifically in the form illustrated, but also broadly within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a phonograph, the combination of a record magazine; a sound box carriage; a carriage control member mounted for longitudinal and rocking movement; a feed screw for said carriage; an arm on said control member; a catch for said arm adapted to be released by said carriage at the end of its movement; means for rocking and returning said control member to its initial position on the disengaging of said catch; coacting mandrel members, one of said mandrel members being mounted for longitudinal movement; a spring adapted to yieldingly hold said longitudinally-movable mandrel members in its operative and inoperative positions; a tappet pin on said longitudinally movable mandrel member; a coacting tappet on said control member arm, said arm and tappet being adapted to coact with said pin in shifting said mandrel member past a central position; a record engaging tappet on said control member adapted to engage the record when the control member is shifted to its initial position; means for bringing said magazine to and locking it in operative position relative to said sound box carriage comprising a slidably mounted locking member, a return spring therefor; an arm connected to said locking member adapted to be engaged by said carriage whereby the locking member is engaged by

the setting of said carriage; and catches on said carriage control member and on said arm adapted to engage when the control member is in its set position and to be disengaged when said control member is rocked to disengage the carriage from the feed screw.

2. In a phonograph, the combination of a record magazine; a sound box carriage; a carriage control member mounted for longitudinal and rocking movement; a feed screw for said carriage; an arm on said control member; a catch for said arm adapted to be released by said carriage at the end of its movement; means for rocking and returning said control member to its initial position on the disengaging of said catch; coacting mandrel members, one of said mandrel members being mounted for longitudinal movement; a tappet pin on said longitudinally movable mandrel member; a coacting tappet on said control member arm, said arm and tappet being adapted to coact with said pin in shifting said mandrel member; a record engaging tappet on said control member adapted to engage the record when the control member is shifted to its initial position; means for bringing said magazine to and locking it in operative position relative to said sound box carriage comprising a slidably mounted locking member; a return spring therefor; an arm connected to said locking member adapted to be engaged by said carriage whereby the locking member is engaged by the setting of said carriage; and catches on said carriage control member and on said arm adapted to engage when the control member is in its set position and to be disengaged when said control member is rocked to disengage the carriage from the feed screw.

3. In a phonograph, the combination of a record magazine; a sound box carriage; a carriage control member mounted for longitudinal and rocking movement; a feed screw for said carriage; an arm on said control member; a catch for said arm adapted to be released by said carriage at the end of its movement; means for rocking and returning said control member to initial position on the disengaging of said catch; coacting mandrel members, one of said mandrel members being mounted for longitudinal movement; a spring adapted to yieldingly hold said longitudinally-movable mandrel member in its operative and inoperative positions; a tappet pin on said longitudinally movable mandrel member; a coacting tappet on said control member arm, said arm and tappet being adapted to coact with said pin in shifting said mandrel member past a central position; means for bringing said magazine to and locking it in operative position relative to said sound box carriage comprising a slidably mounted

locking member; a return spring therefor; an arm connected to said locking member adapted to be engaged by said carriage whereby the locking member is engaged by the setting of said carriage; and catches on said carriage control member and on said arm adapted to engage when the control member is in its set position and to be disengaged when said control member is rocked to disengage the carriage from the feed screw.

4. In a phonograph, the combination of a record magazine; a sound box carriage; a carriage control member mounted for longitudinal and rocking movement; a feed screw for said carriage; an arm on said control member; a catch for said arm adapted to be released by said carriage at the end of its movement; means for rocking and returning said control member to its initial position on the disengaging of said catch; coacting mandrel members, one of said mandrel members being mounted for longitudinal movement; a tappet pin on said longitudinally-movable mandrel member; a coacting tappet on said control member arm, said arm and tappet being adapted to coact with said pin in shifting said mandrel member; means for bringing said magazine to and locking it in operative position relative to said sound box carriage comprising a slidably mounted locking member; a return spring therefor; an arm connected to said locking member adapted to be engaged by said carriage whereby the locking member is engaged by the setting of said carriage; and catches on said carriage control member and on said arm adapted to engage when the control member is in its set position and to be disengaged when said control member is rocked to disengage the carriage from the feed screw.

5. In a phonograph, the combination of a record holder; a sound box carriage; a carriage control member mounted for longitudinal and rocking movement; a feed screw for said carriage; an arm on said control member; a catch for said arm adapted to be released by said carriage at the end of its movement; means for rocking and returning said control member to its initial position on the disengaging of said catch; coacting mandrel members, one of said mandrel members being a driven member and the other being mounted for longitudinal movement; a spring adapted to yieldingly hold said longitudinally-movable mandrel member in its operative and inoperative position; a tappet pin on said longitudinally movable mandrel member; a coacting tappet on said control member arm, said arm and tappet being adapted to coact with said pin in shifting said mandrel member past a central position; and a record engaging tappet on said control

member adapted to engage the record when the control member is shifted to its initial position.

6. In a phonograph, the combination of a record holder; a sound box carriage; a carriage control member mounted for longitudinal and rocking movement; a feed screw for said carriage; an arm on said control member; a catch for said arm adapted to be released by said carriage at the end of its movement; means for rocking and returning said control member to its initial position on the disengaging of said catch; coacting mandrel members, one of said mandrel members being a driven member and the other being mounted for longitudinal movement; a tappet pin on said longitudinally movable mandrel member; a coacting tappet on said control member arm, said arm and tappet being adapted to coact with said pin in shifting said mandrel member; and a record engaging tappet on said control member adapted to engage the record when the control member is shifted to its initial position.

7. In a phonograph, the combination of a record holder; a sound box carriage; a carriage control member mounted for longitudinal and rocking movement; a feed screw for said carriage; an arm on said control member; a catch for said arm adapted to be released by said carriage at the end of its movement; means for rocking and returning said control member to its initial position on the disengaging of said catch; coacting mandrel members, one of said mandrel members being a driven member and the other being mounted for longitudinal movement; a spring adapted to yieldingly hold said longitudinally-movable mandrel member in its operative and inoperative positions; a tappet pin on said longitudinally movable mandrel member; and a coacting tappet on said control member arm, said arm and tappet being adapted to coact with said pin in shifting said mandrel member past a central position.

8. In a phonograph, the combination of a record holder; a sound box carriage; a carriage control member mounted for longitudinal and rocking movement; a feed screw for said carriage; an arm on said control member; a catch for said arm adapted to be released by said carriage at the end of its movement; means for rocking and returning said control member to its initial position on the disengaging of said catch; coacting mandrel members, one of said mandrel members being a driven member and the other being mounted for longitudinal movement; a tappet pin on said longitudinally movable mandrel member; and a coacting tappet on said control member arm, said arm and tappet being adapted to coact with said pin in shifting said mandrel member.



9. In a phonograph, the combination of a record magazine; a sound box carriage; a feed screw for said carriage; a control member mounted for longitudinal and rocking  
 5 movement; a catch for said control member adapted to be released by said carriage at the end of its movement; means for rocking and returning said control member to its  
 10 initial position on the disengaging of said catch; coacting mandrel members, one of said mandrel members being mounted for longitudinal movement; actuating connections for said control member to said longitudinally-movable mandrel member, said  
 15 control member being adapted on its return movement to disengage the record from said mandrel members; means for setting said carriage and said control member; means for bringing said magazine to and locking  
 20 it in operative position relative to said sound box carriage comprising a slidably mounted locking member, a return spring therefor, an arm connected to said locking member adapted to be engaged by said carriage whereby the locking member is shifted  
 25 by the setting of said carriage; and catches on said carriage control member and on said arm adapted to engage when the control member is in its set position and to be disengaged when said control member is rocked to disengage the carriage.

10. In a phonograph, the combination of a record magazine; a sound box carriage; a feed screw for said carriage; a control member mounted for longitudinal and rocking  
 35 movement; a catch for said control member adapted to be released by said carriage at the end of its movement; means for rocking and returning said control member to its  
 40 initial position on the disengaging of said catch; coacting mandrel members, one of said mandrel members being mounted for longitudinal movement; actuating connections for said control member to said longitudinally-movable mandrel member; means  
 45 for setting said carriage and said control member; means for bringing said magazine to and locking it in operative position relative to said sound box carriage comprising a slidably mounted locking member, a return spring therefor, an arm connected to said locking member adapted to be engaged by said carriage whereby the locking member is shifted by the setting of the carriage; and  
 50 catches on said carriage control member and on said arm adapted to engage when the control member is in its set position and to be disengaged when said control member is rocked to disengage the carriage.

60 11. In a phonograph, the combination of a record magazine; a sound box carriage; a feed screw for said carriage; a control member mounted for longitudinal and rocking  
 65 adapted to be released by said carriage at

the end of its movement; means for rocking and returning said control member to its initial position on the disengaging of said catch; coacting mandrel members, one of  
 70 said mandrel members being mounted for longitudinal movement; actuating connections for said control member to said longitudinally-movable mandrel member, said control member being adapted on its return movement, to disengage the record from said  
 75 mandrel members; means for setting said carriage and said control member; and means for locking said magazine in operative position relative to said sound box carriage adapted to be automatically actuated  
 80 by the setting of the carriage and to be released by said carriage disengaging means.

12. In a phonograph, the combination of a record magazine; a sound box carriage; a feed screw for said carriage; a control member mounted for longitudinal and rocking  
 85 movement; a catch for said control member adapted to be released by said carriage at the end of its movement; means for rocking and returning said control member to its initial position on the disengaging of said catch; coacting mandrel members, one of  
 90 said mandrel members being mounted for longitudinal movement; actuating connections for said control member to said longitudinally-movable mandrel member; means for setting said carriage and said control member; and means for locking said magazine in operative position relative to said  
 95 sound box carriage adapted to be automatically actuated by the setting of the carriage and to be released by said carriage disengaging means.

13. In a phonograph, the combination of a record holder; a sound box carriage; a  
 105 feed screw for said carriage; a control member mounted for longitudinal and rocking movement; a catch for said control member adapted to be released by said carriage at the end of its movement; means for rocking  
 110 and returning said control member to its initial position on the disengaging of said catch; coacting mandrel members, one of said mandrel members being mounted for longitudinal movement; actuating connections for said control member to said longitudinally-movable mandrel member, said control member being adapted on its return movement, to disengage the record from  
 115 said mandrel members; and means for setting said carriage and said control member.

14. In a phonograph, the combination of a record holder; a sound box carriage; a feed screw for said carriage; a control member mounted for longitudinal and rocking  
 125 movement; a catch for said control member adapted to be released by said carriage at the end of its movement; means for rocking and returning said control member to its initial position on the disengaging of said  
 130

catch; coacting mandrel members, one of said mandrel members being mounted for longitudinal movement; actuating connections for said control member to said longitudinally-movable mandrel member; and means for setting said carriage and said control member.

15. In a phonograph, the combination of a sound box carriage; a feed means therefor; coacting mandrel members; driving means for one of said mandrel members the other being mounted for longitudinal movement; a record magazine; means for manually adjusting said record magazine, said record magazine being normally freely movable by said manual adjusting means; a magazine positioning and locking member for positioning and locking said magazine in operative position relative to the sound box carriage; manually operated means for setting said carriage, the magazine positioning and locking member and said longitudinally movable mandrel member being actuated thereby, the carriage feed and mandrel driving means being released by the setting of the carriage; and means for automatically releasing said carriage and said magazine positioning and locking member and shifting said longitudinally movable mandrel member at the end of the feed movement of the carriage.

16. In a phonograph, the combination of a record holder; a sound box carriage; coacting mandrel members, one of said mandrel members being mounted for longitudinal movement; means for setting said carriage; a tappet member on said movable mandrel member; and a co-acting tappet member on said carriage, whereby said movable mandrel member is actuated with said carriage.

17. In a phonograph, the combination of a record holder, a sound box carriage; a sound box control member mounted for longitudinal movement; a feed screw for said carriage; an arm on said control member; a catch for said arm adapted to be released by the carriage at the end of its movement; coacting mandrel members, one of said members being mounted for longitudinal movement; a spring adapted to yieldingly hold said longitudinally movable mandrel member in its inoperative position; a tappet pin on said longitudinally movable mandrel member, and a co-acting tappet on said control member, said control member arm and tappet being adapted to coact with said tappet pin in shifting said mandrel member past a central position.

18. In a phonograph, the combination of a record holder, a sound box carriage; a sound box control member mounted for longitudinal movement; a feed screw for said carriage; an arm on said control member; a catch for said arm adapted to be released

by the carriage at the end of its movement; coacting mandrel members, one of said members being mounted for longitudinal movement; a tappet pin on said longitudinally movable mandrel member; and a coacting tappet on said control member, said control member arm and tappet being adapted to coact with said tappet pin in shifting said mandrel member.

19. In a phonograph, the combination of a record holder; a sound box carriage; coacting mandrel members, one of said members being mounted for longitudinal movement; a spring adapted to yieldingly hold said longitudinally movable mandrel member in its operative and inoperative positions; means for setting said carriage; and means associated with said carriage for shifting said mandrel member past its central position.

20. In a phonograph, the combination with a frame, of a record holder; a pair of coacting mandrel members, one of said members being mounted for longitudinal movement; a spring having one arm connected to said frame and the other to said movable mandrel member, the point of connection for said spring to said movable mandrel member being adapted to be shifted past the point of connection for said spring to said frame whereby said spring serves to yieldingly retain said mandrel member in its operative and inoperative positions; and means for shifting said mandrel member.

21. In a phonograph, the combination of a record holder; of a pair of coacting mandrel members, one of said mandrel members being mounted for longitudinal movement; a spring adapted to hold said longitudinally movable member in its operative and in its inoperative position; and means for shifting said member.

22. In a phonograph, the combination of a record magazine; a sound box carriage; means for adjusting said carriage to its operative and inoperative positions; means for bringing said magazine to and locking it in operative position relative to said sound box carriage comprising a plurality of pins on said magazine; a coacting A-shaped member having a slot at the apex of its arms adapted to receive said pins, the distance between the points of the arms being slightly less than the distance between the pins, one of the arms being provided with an outwardly-inclined pin engaging surface; a slidably mounted rod by which said locking member is carried, a return spring therefor, an arm on said rod adapted to be engaged by said carriage whereby the locking member is actuated by the setting of said carriage, and a catch for said locking means adapted to be engaged when said carriage is in operative position and to be disengaged when the carriage is in its inoperative position.



23. In a phonograph, the combination of a record magazine; a sound box carriage; means for adjusting said carriage to its operative and inoperative positions; means for  
 5 bringing said magazine to and locking it in operative position relative to said sound box carriage comprising a plurality of pins on said magazine; a coacting A-shaped member, a slidably mounted rod by which said  
 10 locking member is carried, a return spring therefor, an arm on said rod adapted to be engaged by said carriage whereby the locking member is actuated by the setting of said carriage, and a catch for said locking means  
 15 adapted to be engaged when said carriage is in operative position and to be disengaged when the carriage is in its inoperative position.

24. In a phonograph, the combination of a  
 20 record magazine; means for bringing said magazine to and locking it in operative position comprising a plurality of pins on said magazine, and an adjustable coacting A-shaped member having a slot at the apex of  
 25 its arms adapted to receive said pins, the distance between the points of the arms being slightly less than the distance between the pins, one of the arms being provided with an outwardly-inclined pin engaging surface.

30 25. In a phonograph, the combination of a revolubly mounted record magazine; means for bringing said magazine to and locking it in operative position comprising a plurality of pins on said magazine, an adjustable co-  
 35 acting member having diverging pin engaging arms and a pin engaging slot at the apex of said arms.

26. In a phonograph, a record magazine comprising a wheel and a plurality of cylindrical  
 40 record holders arranged on the periphery of said wheel, said holders being adapted to receive cylindrical records when presented endwise thereto and being open on their outer sides; the width of the openings  
 45 in the sides being less than the diameter of the records to be supported and guards comprising curved wires disposed at the ends of said holders, the holders moving between said guards as the magazine is revolved.

50 27. In a phonograph, a record magazine comprising a wheel and a plurality of record holders formed of a strip bent into a series of cylindrical loops, the loops being open on their outer sides and ends whereby records  
 55 may be introduced therein when presented longitudinally thereto the width of the openings in the sides of the holders being less than that of the diameter of the records to be supported.

60 28. In a phonograph, a record magazine comprising a plurality of record holders open on their outer sides and at their ends, said holders being adapted to receive cylindrical records when the same are presented  
 65 endwise thereto, the width of the openings

in the sides of the holders being less than that of the diameter of the records to be supported.

29. In a phonograph, the combination of a sound box carriage; a way therefor comprising a supporting rod and a sleeve mounted on said rod to be moved longitudinally and rocked thereon, said carriage being slidably mounted on said sleeve; a feed screw for said carriage; a rod carried by said  
 70 sleeve adapted to disengage said carriage from said feed screw when the said sleeve is rocked rearwardly; an arm on said sleeve; a return spring for said sleeve connected to said arm so that it also holds said sleeve in its forward position; an inclined member adapted to raise said arm when the sleeve is returned to its initial position by said spring whereby the sleeve is rocked to disengage the carriage; a catch for said sleeve arm  
 75 adapted to be released by said carriage at the end of its movement; and means for shifting said carriage on said sleeve and said sleeve to operative position.

30. In a phonograph, the combination of  
 90 a sound box carriage; a control member mounted for longitudinal and rocking movement; an arm on said control member; a return spring for said control member connected so that it also holds said control member in its forward position; an inclined member adapted to raise said arm when said control member is returned to its initial position by said spring whereby said control member is rocked to disengage said carriage; a catch for said arm adapted to be released by said carriage at the end of its movement; and means for setting said carriage and said control member.

31. In a phonograph, the combination of  
 105 a sound box carriage; a control member therefor mounted for longitudinal and rocking movement; a return spring for said control member; a member adapted to rock said control member when it is returned to its initial position by said spring; a catch for said control adapted to be released by said carriage at the end of its movement; and means for setting said carriage and said control member.

32. In a phonograph, the combination of a sound box carriage, a control member mounted for rocking and longitudinal movement, said carriage being mounted to travel on said control member; a feed screw for said carriage; a catch for said control member, adapted to be released by said carriage at the end of its movement; a return spring for said control member; an inclined member arranged to engage said control member for rocking said control member on its return to its initial position, and a member on said control member for lifting said carriage on such rocking movement.

33. In a phonograph, the combination of 130

a record magazine; a sound box carriage; a carriage control member mounted for longitudinal and rocking movement; a feed screw for said carriage; a catch for said control member; means for rocking and returning said control member to its initial position on the disengaging of said catch, said catch being released by said carriage at the end of its movement; means for locking said magazine in operative position relative to said sound box carriage comprising a slidably mounted locking member; a return spring therefor, a catch for said locking member arranged on said control member to engage when the control member is in its set position and to disengage when the control member is rocked to disengage the carriage from the feed screw.

34. In a phonograph, the combination of a sound box carriage; a carriage control member mounted for longitudinal and rocking movement, the carriage and control member having independent longitudinal movement, said control member being moved to its set position by the setting of said carriage; means for feeding said carriage; a catch for said control member adapted to be released by said carriage at the end of its movement, and an inclined member for rocking said control member on its return to its initial position.

35. In a phonograph, the combination of a magazine, a sound box carriage; a carriage control member mounted for longitudinal and rocking movement; the carriage and control member having independent longitudinal movement, said control member being moved to its set position by the setting of said carriage; a return spring for said control member; means for feeding said carriage; a catch for said control member adapted to be released by said carriage at the end of its movement; and an inclined member arranged to act on said control member as it is returned to its initial position by said spring.

36. In a phonograph, the combination of a magazine, a sound box carriage, a control member mounted for longitudinal and rocking movement; the carriage and control member having independent longitudinal

movement, said control member being moved to its set position by the setting of said carriage; a return spring for said control member; means for feeding said carriage; and a catch for said control member adapted to be released by said carriage at the end of its movement.

37. In a phonograph, the combination of a sound box carriage; a carriage control member mounted for longitudinal and rocking movement; the carriage and control member having independent longitudinal movement, said control member being moved to its set position by the setting of said carriage; means for feeding said carriage; a catch for said control member adapted to be released by said carriage at the end of its movement, and an inclined member arranged to act on said control member and on its return to its initial position.

38. In a phonograph, the combination of the sound box carriage, a carriage control member mounted for longitudinal and rocking movement, the carriage and control member having independent longitudinal movement, said control member being moved to its set position by the setting of said carriage, means for feeding said carriage, a catch for said control member, adapted to be released by said carriage at the end of its movement, and means for rocking and returning said control member to its position on the disengaging of said catch.

39. In a phonograph, the combination of a record holder, of a sound box carriage, means for feeding said carriage, co-acting mandrel members, one of said mandrel members being mounted for longitudinal movement, a spring adapted to yieldingly hold said longitudinal movable mandrel member in its operative and inoperative positions, and means for shifting said mandrel member past its central position.

In witness whereof, I have hereunto set my hand and seal in the presence of two witnesses.

CYRUS C. SHIGLEY. [L. s.]

Witnesses:

C. F. LOCKWOOD,  
ALDRICH BLAKE.



181-7



T. H. TOWELL.  
HORN FOR TALKING MACHINES.  
APPLICATION FILED JULY 29, 1910.

1,024,108.

Patented Apr. 23, 1912.  
3 SHEETS-SHEET 1.

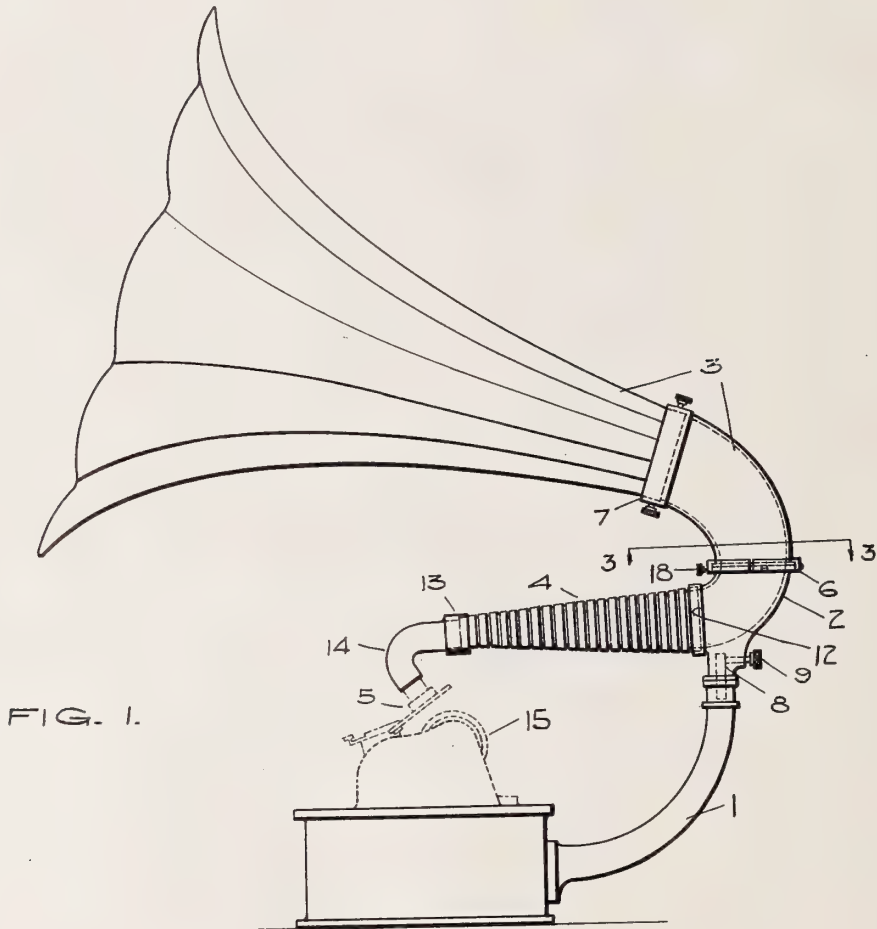


FIG. 1.

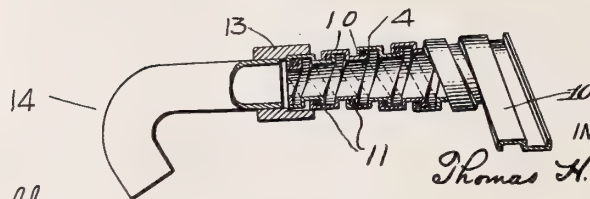


FIG. 5.

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3 SHEETS—SHEET 2.

FIG. 4.

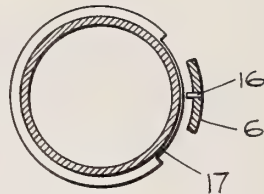
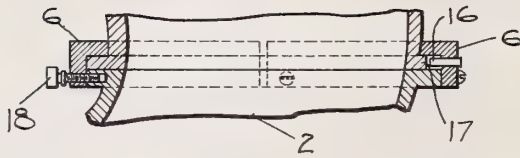


FIG. 3.

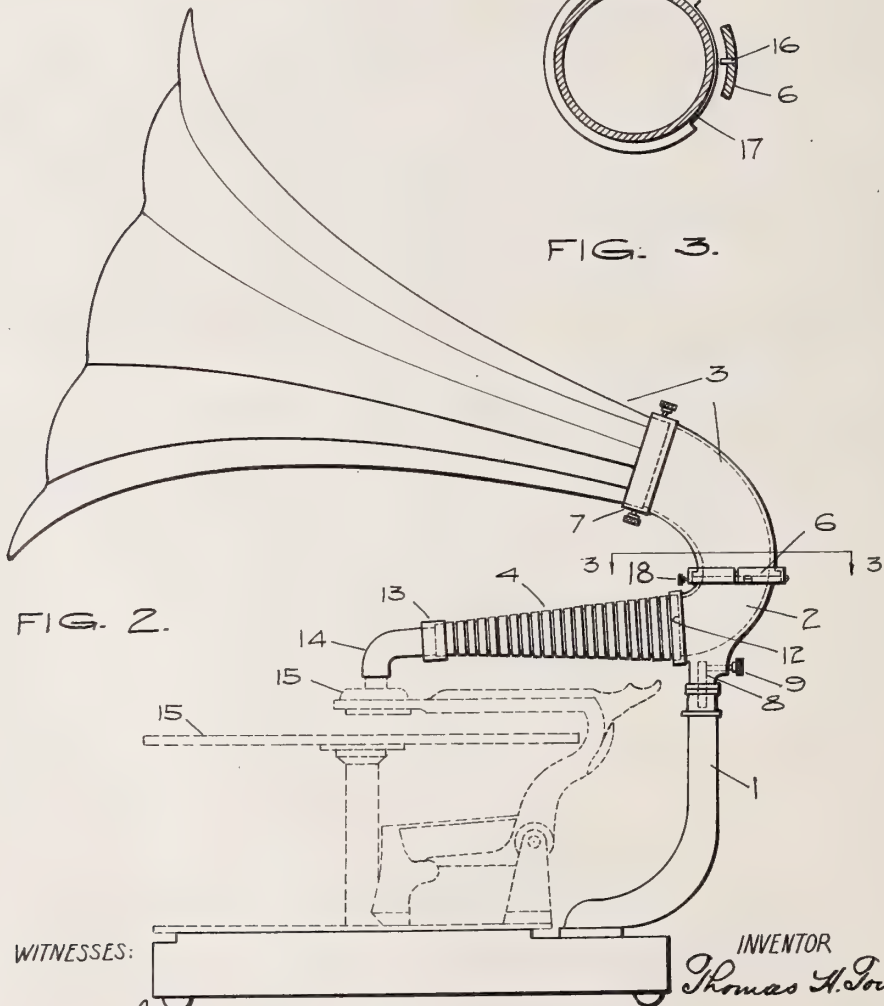


FIG. 2.

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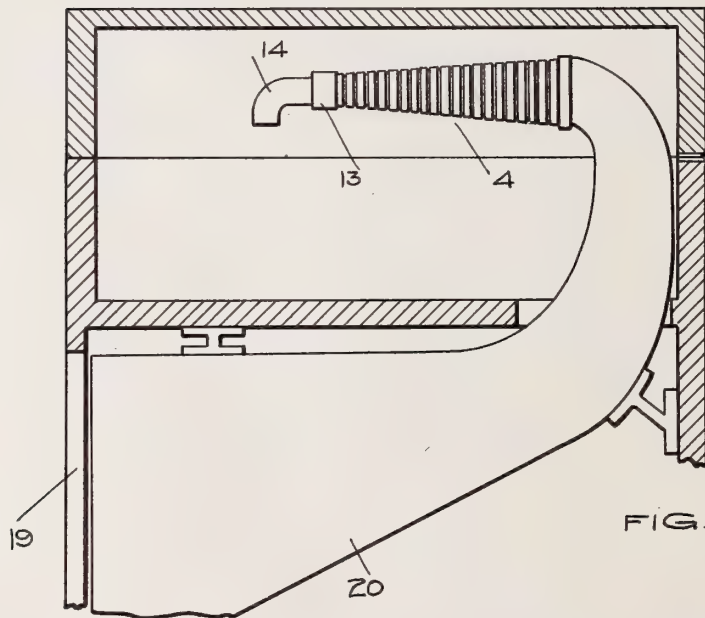
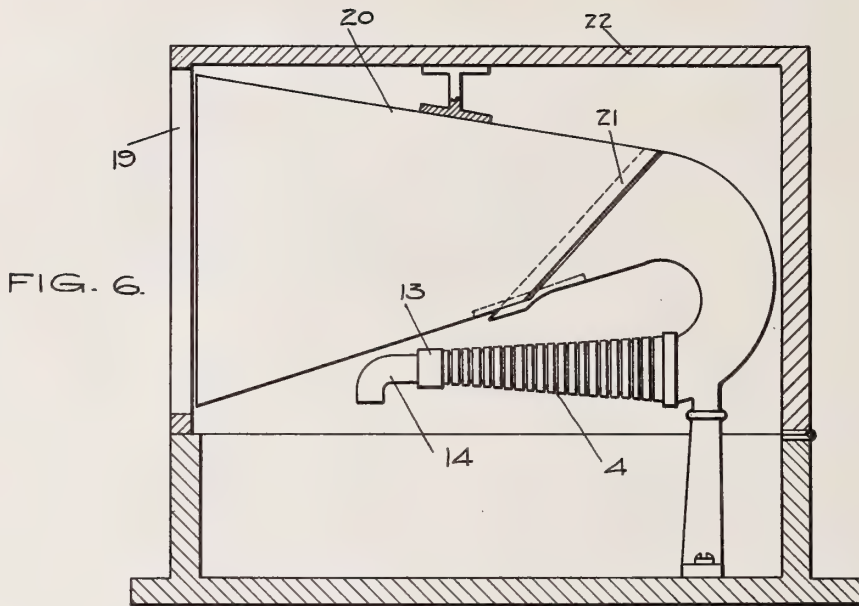


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3 SHEETS—SHEET 3.



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# UNITED STATES PATENT OFFICE.

THOMAS H. TOWELL, OF CLEVELAND, OHIO, ASSIGNOR TO THE UNITED STATES PHONOGRAPH COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

## HORN FOR TALKING-MACHINES.

1,024,108.

Specification of Letters Patent.

Patented Apr. 23, 1912.

Application filed July 29, 1910. Serial No. 574,467.

*To all whom it may concern:*

Be it known that I. THOMAS H. TOWELL, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Horns for Talking-Machines, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The present invention, relating as indicated to horns for talking machines, has as its object the provision of a horn suitable for use on such machines whether of the disk or cylinder type, and one that will be readily adjustable to the various requirements encountered in operating either such type of machine.

To the accomplishment of these and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims, it being noted that claims specifically drawn to the improved sound amplifier as such are presented in a separate divisional application, filed March 18, 1912, Serial No. 684,443.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:—Figure 1 is a side elevation of one typical form of cylinder talking machine with a horn shown in connection therewith embodying the present improvements; Fig. 2 is a side elevation similar to that of Fig. 1 but showing the horn as applied to a talking machine of the disk type; Fig. 3 is a horizontal sectional detail of such horn; Fig. 4 is a vertical section of a detail of the jointed elbow connecting the tone arm with the amplifier proper; Fig. 5 is similarly a vertical section of the forward end of said tone arm, the pitch of the coiled interlocking strip composing such tone arm being exaggerated in order to render the construction of the latter clear; and Figs. 6 and 7 show the adaptation of the horn to two types of cabinets.

Referring first of all to the form of the horn illustrated in Fig. 1, it will be noted that such horn is there shown as applied to

a talking machine of the cylinder type. Only the outline of such machine, however, is shown together with the case or cabinet upon which it is mounted. The horn is designed to be supported upon a bracket 1 extending rearwardly and upwardly from said cabinet and comprises in effect three portions, a tubular elbow 2 pivotally mounted upon the bracket in question about a vertical axis, an amplifying horn 3 proper, and an extension 4 forming the sound-conveying connection between the small end of the latter and the sound-box 5 of the talking machine. The openings of such tubular elbow are substantially right angularly related and it is with the upwardly directed one that the amplifying horn is connected, being pivotally secured to the elbow by a sectional flange 6, as clearly shown in Fig. 4, one section of such flange being detachably secured in place by a set-screw 18, whereby the horn may be entirely removed from the elbow. Said horn is furthermore constructed in one or more sections, which may be separated, as at the joint 7, if desired to facilitate packing in case of shipment or storage, the horn being more or less in the way when not in use.

Pivotal movement of horn 3 upon the bracket is limited in either direction by a stop 16 carried by the other section of such flange and coöperating with a segmental notch or recess 17 in the edge of the horn, as will be readily understood. The elbow 2 is thus pivotally mounted about an upwardly directed pin or stud 8 on the bracket 1, and is designed to be normally fixedly secured, or in other words, held against rotation, by means of a set screw 9, that coöperates with such pin. It is not designed that such elbow shall have any movement about this pin in the normal use of the horn, such pivoting being merely provided in order to enable the horn to be swung to one side, in case it becomes desirable to entirely disconnect the same from the sound-box.

The sound conveyer 4 extending from the small end of the horn 3, or rather from the horizontally directed opening of the elbow 2, to the sound-box comprises a section of flexible metallic tubing, a preferred constructional form of such tubing being that shown in the sectional view of Fig. 5, from which it will be seen to consist of coiled interlocking strips 10 of metal, with an inter-



posed packing strip 11. Such sound-conveyer is furthermore made tapering to conform with the taper of the amplifying horn and elbow so that, in other words, there is a continuous and general increase in the diameter of the bore of the passage formed by such extension, elbow and the amplifier, proper.

The larger end of the conveyer is received in an annular socket or recess 12 formed in the casting constituting the elbow, while a ferrule or sleeve 13 is similarly fitted over the smaller end of such conveyer, one end of the short recurved tube, or elbow 14, that connects the sound conveyer with the sound box being designed to slidably fit within such sleeve, just as the other end of such tube 14, fits slidably over the upwardly extending tubular portion of the sound-box 5.

The flexible character of the sound conveyer permits the sound-box to travel across the record upon the record support 15 with perfect freedom, while still preserving a direct connection with the amplifier. The bore, moreover, of such conveyer, increases gradually in diameter in accordance with the well known principle of acoustics, so that the sounds emanating from the sound-box are reproduced in perfect tone and undiminished volume. The horn proper may obviously be swung so as to extend in any desired direction without interfering in the slightest with the flexing of the sound conveyer although the stop 16 prevents any turning of the horn to an extent that might overbalance the machine. When it is desired to remove the horn this is readily accomplished by releasing the set-screw 18 that holds the detachable section of the retaining flange in place. Should it, furthermore, become necessary or desirable to entirely disconnect the sound conveyer from the sound-box in order to get at the machine, this may be accomplished by simply loosening set screw 9, when the elbow, together with the sound conveyer and amplifier attached thereto, may be swung to one side.

Practically no modification is required in the construction hereinbefore described in order to adapt the same for use with a talking machine of the disk type instead of the cylinder type. Thus in Fig. 2 it will be seen that by slightly modifying the form of the bracket 1 whereby the tubular elbow 2 is supported the horn may be bodily transferred to such disk type.

What has just been said concerning the disk type machine applies equally to the use of my improved construction of horn in talking machine cabinets of the several kinds familiar to the trade. Thus in Fig. 6, the adaptation of such horn is shown to a cabinet wherein the discharge opening 19 is located above the machine. The horn or

amplifier 20 proper here does not require to be pivotally secured to the elbow so that the flange connection 6 may be omitted. The horn, however, is made separable as at 21 on an inclined plane so as to permit that portion of the horn which is fixedly attached to the cover 22 to be raised when the latter is tilted upwardly. The construction of the flexible sound box with the elbow is, however, the same as before. In Fig. 7 the discharge opening is shown as being located below the talking machine compartment of the cabinet, thus requiring the horn to be curved downwardly instead of upwardly. As it does not in this form of construction require to be separated at all, the connection between the elbow and the horn or amplifier proper may be made a fixed one, or the two parts in question may be in effect constructed integrally.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means to be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In a talking machine, the combination of a record support, a generally tapering amplifying horn proper mounted at its smaller end adjacent to said support, a flexible tubular extension to such smaller end consisting of coiled interlocking strips, such extension being tapered to conform with the taper of said amplifying horn and projecting over said record support, and a sound-box connected with the outer end of such extension.

2. In a talking machine, the combination of a record support, a curved amplifying horn proper of generally tapering form pivotally mounted at its smaller end adjacent to said support, a flexible tubular extension to such smaller end consisting of coiled interlocking strips of metal, such extension being tapered to conform with the taper of said amplifying horn and projecting over said record support, and a sound-box connected with the outer end of said extension.

3. In a talking machine, the combination of a record support; a tubular elbow with substantially right angularly related openings mounted adjacent to said support with one such opening directed upwardly; a generally tapering amplifying horn proper connected with such upwardly directed opening; a flexible sound conveyer consisting of interlocking strips connected with the other opening in said elbow, said conveyer being tapered to conform with the taper of said amplifying horn and projecting over said record support; and a sound-

box connected with the outer end of said conveyer.

4. In a talking machine, the combination of a record support; a tubular elbow with substantially right angularly related openings mounted adjacent to said support with one such opening directed upwardly; a generally tapering amplifying horn proper connected with such upwardly directed opening; a flexible sound conveyer consisting of coiled interlocking strips of metal connected with the other opening in said elbow, said conveyer being tapered to conform with the taper of said amplifying horn and projecting over said record support; and a sound-box connected with the outer end of said conveyer.

5. In a talking machine, the combination of a record support; a tubular elbow with substantially right angularly related openings mounted adjacent to said support with one such opening directed upwardly; a generally tapering amplifying horn proper pivotally mounted upon said elbow and connected with such upwardly directed opening; a flexible sound conveyer consisting of coiled interlocking strips connected with the other opening in said elbow, said conveyer being tapered to conform with the taper of said amplifying horn and projecting over said record support; and a sound-box connected with the outer end of said conveyer.

6. In a talking machine, the combination of a record support; a tubular elbow, with substantially right angularly related openings, pivotal about a vertical axis adjacent to said support, said elbow having one such opening directed upwardly; a generally tapering amplifying horn properly connected with such upwardly directed opening; a flexible sound conveyer consisting of coiled interlocking strips connected with the other opening in said elbow, said conveyer being tapered to conform with the taper of said amplifying horn and projecting over said record support; and a sound-box connected with the other end of said conveyer.

7. In a talking machine, the combination of a record support; a tubular elbow, with substantially right angularly related openings, pivotal about a vertical axis adjacent to said support, said elbow having one such opening directed upwardly; a generally tapering amplifying horn proper pivotally mounted upon said elbow and connected with such upwardly directed opening; a flexible sound conveyer consisting of coiled interlocking strips of metal connected with the other opening in said elbow, said conveyer being tapered to conform with the taper of said amplifying horn and projecting over said record support; and a sound box connected with the other end of said conveyer.

8. In a talking machine, the combination

of a record support; a tubular elbow, with substantially right angularly related openings, pivotal about a vertical axis adjacent to said support, said elbow having one such opening directed upwardly; means adapted to secure said elbow in desired angular position about its axis; a generally tapering amplifying horn proper, connected with such upwardly directed opening; a flexible sound conveyer consisting of coiled interlocking strips connected with the other opening in said elbow, said conveyer being tapered to conform with the taper of said amplifying horn and projecting over sound record support; and a sound box connected with the other end of said conveyer.

9. In a talking machine, the combination of a record support; a tubular elbow, with substantially right angularly related openings, pivotal about a vertical axis adjacent to said support, said elbow having one such opening directed upwardly; a generally tapering amplifying horn proper, detachably pivotally mounted upon said elbow and connected with such upwardly directed opening; a flexible sound conveyer consisting of coiled interlocking strips of metal connected with the other opening in said elbow, said conveyer being tapered to conform with the taper of said amplifying horn and projecting over said record support; and a sound box connected with the other end of said conveyer.

10. In a talking machine, the combination of a record support; a bracket adjacent thereto; a tubular elbow, with substantially right angularly related openings, mounted upon said bracket so as to be pivotal about a vertical axis, said elbow having one such opening directed upwardly; means adapted to secure said elbow in desired angular position about its axis; a generally tapering amplifying horn proper detachably pivotally mounted upon said elbow and connected with such upwardly directed opening; a flexible sound conveyer consisting of coiled interlocking strips of metal connected with the other opening in said elbow, said conveyer being tapered to conform with the taper of said amplifying horn and projecting over said record support; and a sound box connected with the other end of said conveyer.

11. In a talking machine, the combination of a record support; a bracket adjacent thereto; a tubular elbow, with substantially right angularly related openings, mounted upon said bracket so as to be pivotal about a vertical axis, said elbow having one such opening directed upwardly; means adapted to secure said elbow in desired angular position about its axis; a generally tapering amplifying horn connected with such upwardly directed opening; a sectional flange pivotally securing said horn to said elbow,



one of the sections of said flange being detachable, whereupon said horn may be removed; a flexible sound conveyer consisting of coiled interlocking strips of metal connected with the other opening in said elbow, said conveyer being tapered to conform with the taper of said amplifying horn and projecting over said record support; and a

187-2  
sound box connected with the other end of 10 said conveyer.

Signed by me this 25th day of July, 1910.

THOMAS H. TOWELL.

Attested by—

D. T. DAVIES,

JNO. F. OBERLIN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

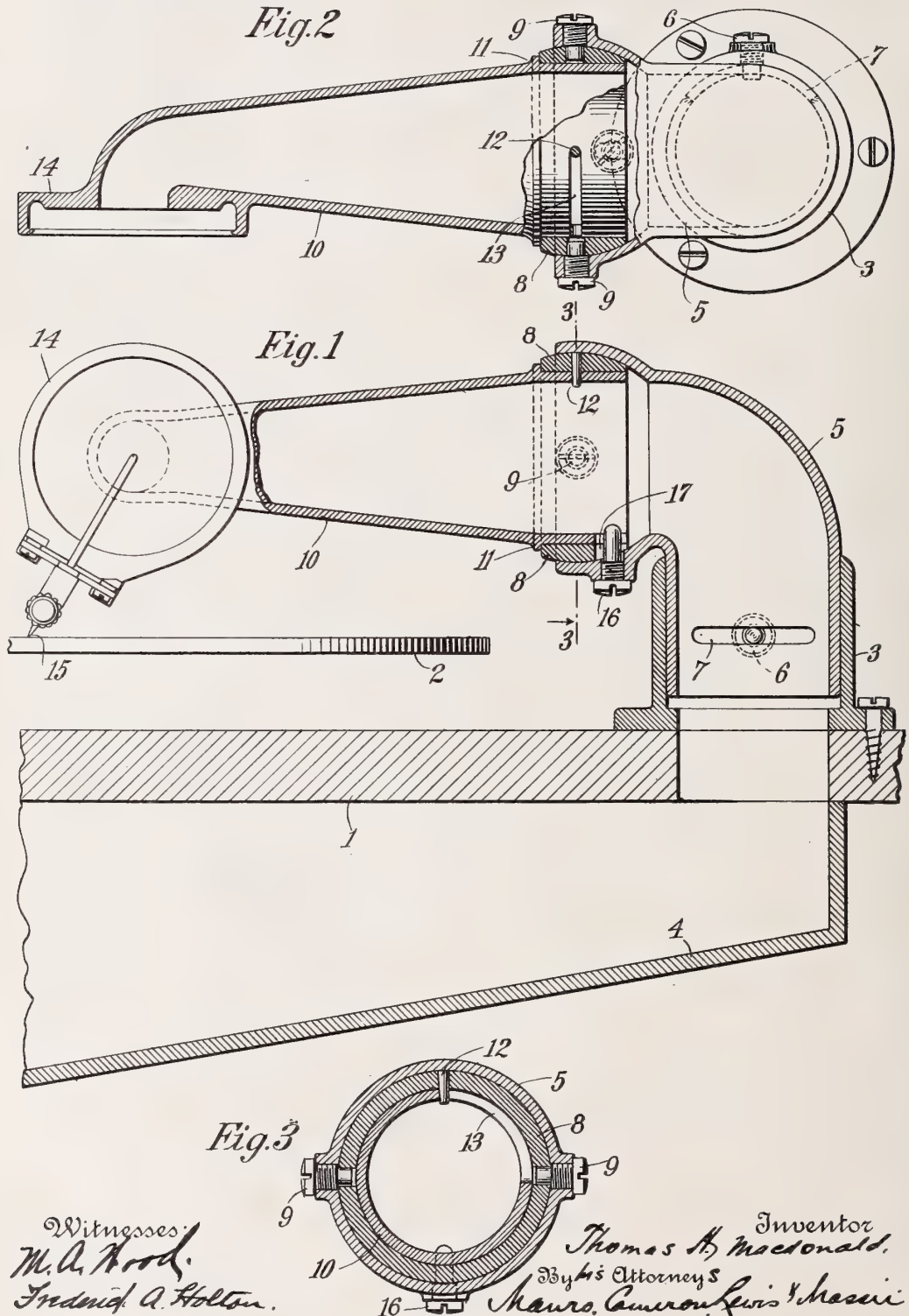




T. H. MACDONALD.  
SUPPORT AND SOUND DUCT FOR SOUND BOXES.  
APPLICATION FILED MAY 14, 1910.

1,024,640.

Patented Apr. 30, 1912.



Witnesses:  
*M. A. Hood.*  
*Frederick A. Holton.*

Inventor  
*Thomas H. Macdonald.*  
By *his Attorneys*  
*Shaw, Cameron & Lewis*

# UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO AMERICAN GRAPHOPHONE COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF WEST VIRGINIA.

## SUPPORT AND SOUND-DUCT FOR SOUND-BOXES.

1,024,640.

Specification of Letters Patent.

Patented Apr. 30, 1912.

Application filed May 14, 1910. Serial No. 561,312.

*To all whom it may concern:*

Be it known that I, THOMAS H. MACDONALD, a citizen of the United States, and resident of Bridgeport, Connecticut, have invented a new and useful Support and Sound-Duct for Sound-Boxes, which invention is fully set forth in the following specification.

My invention relates to talking-machines, particularly the so-called tone-arm for use with graphophones or other talking-machines, and is especially adapted for use with the so-called Grafonola or graphophone inclosed within a cabinet which conceals its horn, though of course it can be used with other types.

The invention consists of the construction and arrangement of parts, and will be best understood by reference to the annexed drawings in which—

Figure 1 is a side view, partly in vertical section of a tone arm embodying my invention and applied to a Grafonola; Fig. 2 is a top view of the same, partly in horizontal section; and Fig. 3 is a transverse section, viewed from the right, through lines 3—3 of Fig. 1.

1 is the base-plate (of the Grafonola, or other type of talking-machine).

2 represents the turn-table and disk sound-record thereon.

3 is a tubular bearing or ferrule, which in the present instance is shown as secured in place by means of wood screws passing through its horizontal flange and into the base-plate 1, so that it will register with an opening which connects with the smaller end of the concealed horn 4 of the Grafonola.

5 is a tubular elbow, whose lower and vertical member journals or swivels within the bearings 3, and is secured in place by means of the screw 6 whose inner end enters the horizontal slot 7 in the member 5, to permit limited play of the elbow upon a vertical axis. The upper (horizontal) end of the elbow-member 5 has a flaring mouth of hemispherical outline. Seated therein is the ring 8, whose outer surface is correspondingly convexed to fit the concave mouth of member 5. The ring 8 is pivoted within its seat in member 5, by means of the horizontal screw-pins 9—9, whose inner ends furnish the journals for the ring 8.

The tapering tone-arm proper 10 has near its larger end a shoulder 11, beyond which is the cylindrical bearing-surface that journals or swivels within the bore of ring 8. A pin 12, secured in ring 8, preferably depending from the top thereof, extends into an annular groove or slot 13 in the adjacent portion of tone-arm 10, to permit limited axial turning of the tone-arm within ring 8.

The sound-box 14 may, if desired, be made integral with the tone-arm; and it carries the usual stylus-bar for the reproducing-needle 15, which co-acts with the record on turn-table 2, in the well known manner.

16 is a screw located in the lower part of the elbow-member 5, and enters a longitudinal slot 17 in the adjacent portion of ring 8 and of tone-arm 10. This engagement prevents tone-arm 10 from tipping axially; but by swinging the tone-arm and sound-box upward (upon bearings 9—9), their slots are disengaged from pin 16, after which the tone-arm can be turned axially, journaling in ring 8, so as to bring needle 15 uppermost for ready removal.

In the position shown in Figs. 1 and 2, the tone-arm 10 and its sound-box can swing freely in the horizontal plane, but the diaphragm of the sound-box cannot be tipped out of its vertical plane. When, however, the tone-arm is swung up (on bearings 9—9), it may then be turned axially; whereupon the pin 16 abuts, as a stop, against the inner end of the tone-arm, and holds the same securely away from the record.

I have described my invention with some particularity, but only for the sake of clearness, since parts may be used to the exclusion of other parts, modifications of construction and arrangement might be resorted to, the device might be used with some other type of talking-machine than the Grafonola, and other modifications might be made without departing from the spirit of my invention.

Having thus described my invention, I claim:

1. The combination with the sound-box of a talking-machine, of a support and sound-duct therefor comprising a tubular member journaling in a fixed bearing, a second tubu-

lar member both journaled and pivoted in the first member and carrying the sound-box, and means for normally preventing said second member from journaling on its axis.

5 2. The combination with the sound-box of a talking-machine, of a support and sound-duct therefor, comprising a tubular member journaled in a fixed bearing, and a second  
10 tubular member carrying the sound-box and both journaled and also pivoted in the first member, whereby said second member with the sound-box may be rotated on its own longitudinal axis and may also be swung in a vertical plane.

15 3. The combination with the sound-box of a talking-machine, of a support and sound-duct therefor comprising a tubular elbow-member journaled in a fixed bearing and having at its other end a spherical mouth,  
20 a ring of corresponding shape fitted in said mouth and secured therein by a horizontal journal, and a second substantially horizontal tubular member journaled in said ring and carrying the sound-box.

25 4. The combination with the sound-box of a talking-machine, of a support and sound-duct therefor comprising a tubular elbow-member journaled in a fixed bearing and having at its other end a spherical mouth, a  
30 ring of corresponding shape fitted in said

mouth and secured therein by a horizontal journal, a second substantially horizontal tubular member journaled in said ring and carrying the sound-box, and means for normally preventing said horizontal member  
35 from journaling in said ring.

5. The combination with a talking-machine, of a sound-box-support and sound-conveyer comprising a tubular elbow-member journaled in a fixed bearing with vertical  
40 axis and having a flaring spherical mouth at its horizontal end, a ring of corresponding shape fitted in said mouth on a horizontal pivot and provided with a longitudinal slot, a tapering tubular member carrying  
45 the sound-box at its outer end and journaled in said ring and provided with a longitudinal slot registering with the first-named slot and also provided with a partial annular slot, a pin carried by said ring and extending  
50 into the last-named slot, and a second pin carried by said elbow-member and extending into the two first-named slots.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

A. B. KEONGH,

C. W. HEDBERG.



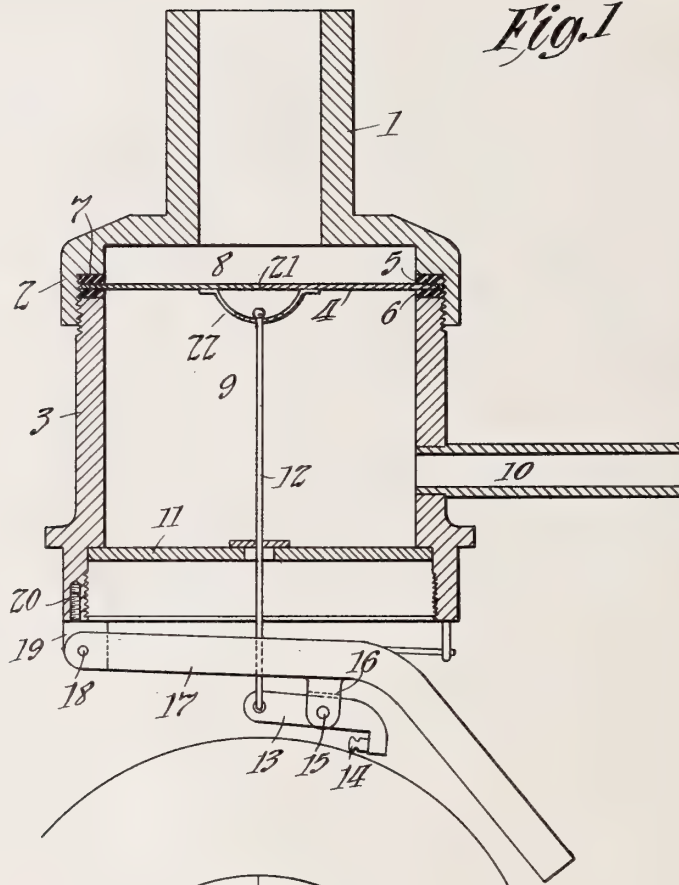


A. N. PIERMAN.  
SOUND REPRODUCER.  
APPLICATION FILED SEPT. 13, 1909.

1,024,696.

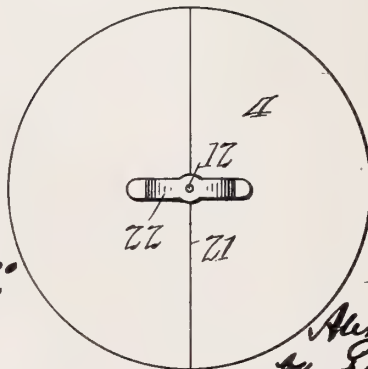
Patented Apr. 30, 1912.

3 SHEETS—SHEET 1.



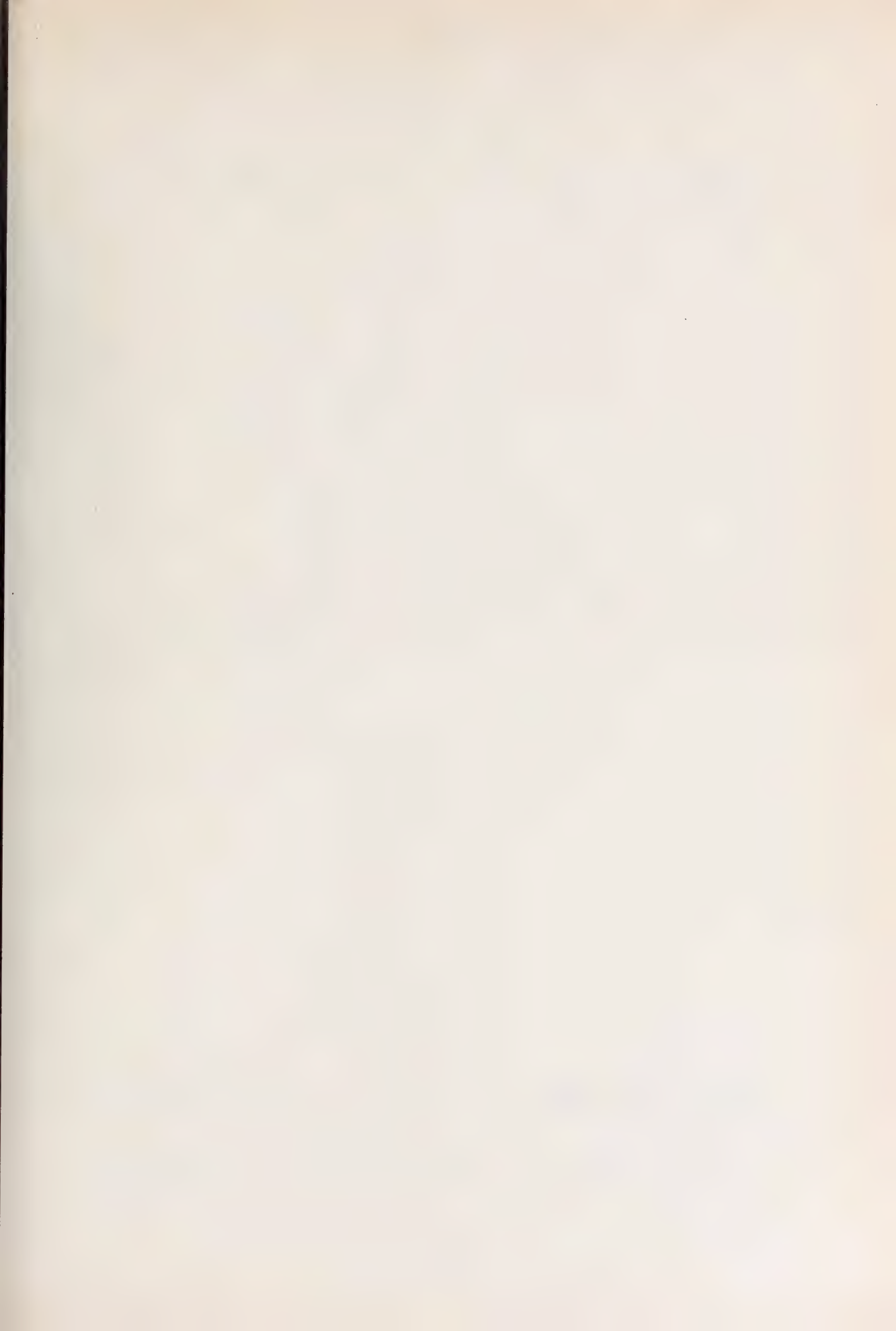
*Fig. 1*

*Fig. 2*



*Witnesses:*  
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*Inventor:*  
Alexander A. Pierman  
by Frank L. Dyer  
*Atty.*

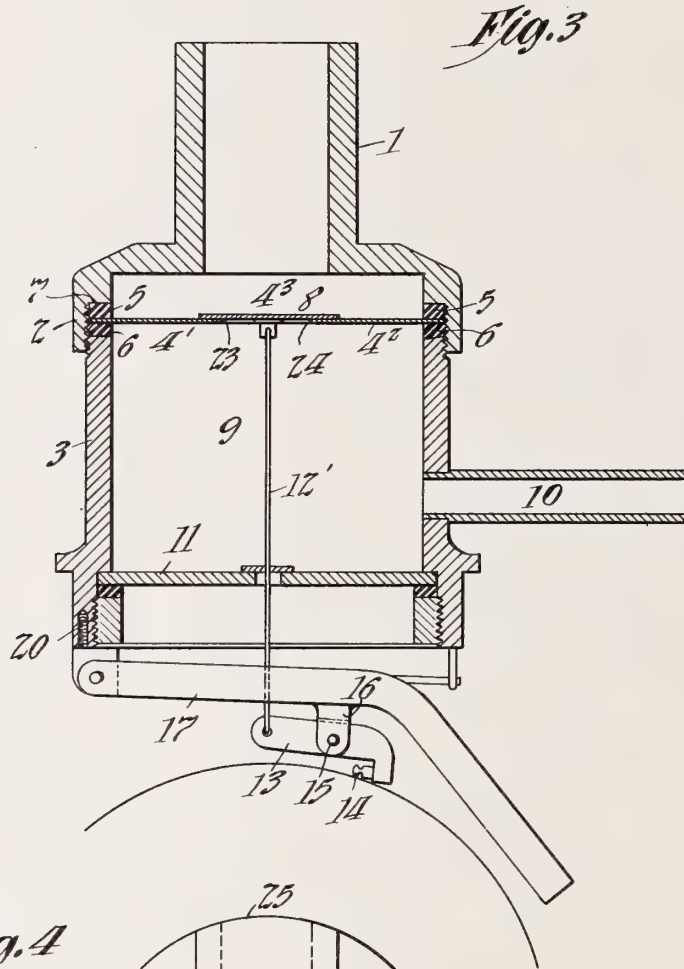


A. N. PIERMAN.  
SOUND REPRODUCER.  
APPLICATION FILED SEPT. 13, 1909.

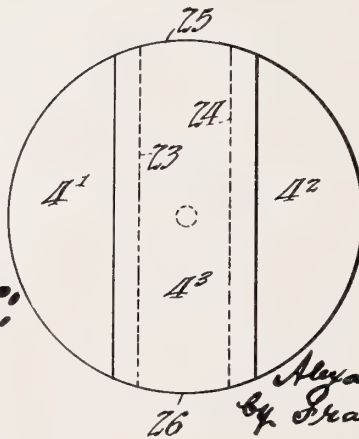
1,024,696.

Patented Apr. 30, 1912.

3 SHEETS—SHEET 2.



*Fig. 4*



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*Atty.*





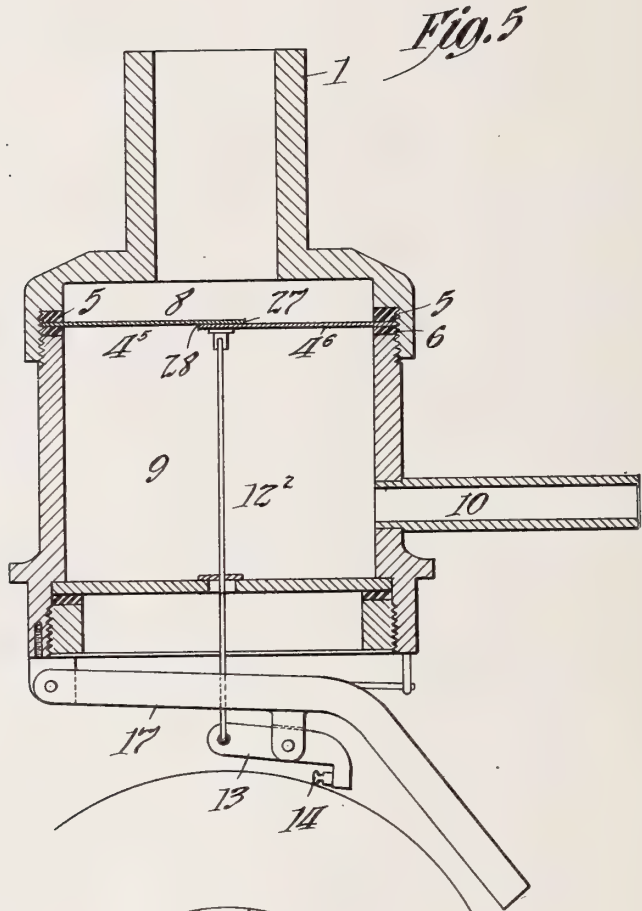
A. N. PIERMAN.  
SOUND REPRODUCER.

APPLICATION FILED SEPT. 13, 1909.

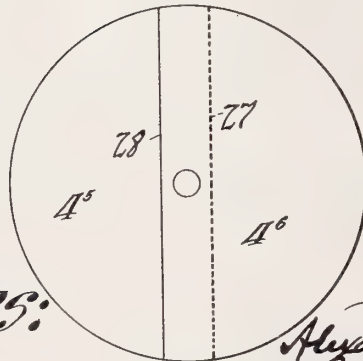
1,024,696.

Patented Apr. 30, 1912.

3 SHEETS-SHEET 3.



*Fig. 6*



*Witnesses:*  
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Dyer Smith

*Inventor:*  
Alexander H. Cushman  
by Frank L. Dyer  
Att'y.

# UNITED STATES PATENT OFFICE.

ALEXANDER N. PIERMAN, OF NEWARK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## SOUND-REPRODUCER.

1,024,696.

Specification of Letters Patent.

Patented Apr. 30, 1912.

Application filed September 13, 1909. Serial No. 517,510.

### *To all whom it may concern:*

Be it known that I, ALEXANDER N. PIERMAN, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have made a certain new and useful Invention in Sound-Reproducers, of which the following is a description.

My invention relates to phonograph reproducers of the pneumatic type, or, generally speaking, of the type in which undulations corresponding to sound waves are impressed upon a current of any suitable moving fluid by the operation of a suitable valve through which the fluid is allowed or caused to pass, the valve being operated in accordance with the sound waves as by connection with a reproducing stylus tracking a record groove.

The improvements covered by my present application reside chiefly in the construction of the valve through which the air or other moving fluid is caused to pass in setting up the undulations corresponding to the sound waves.

The chief object of my invention is the production of a sound reproducer having a vibratory member which serves to set up vibrations corresponding to sound waves in the well known manner when the device is operated under atmospheric pressure, that is to say, when a moving fluid is not progressed therethrough, the vibratory member or diaphragm being so formed as to act as a valve under abnormal or forced fluid pressure, that is to say, when a current of air or other fluid passes through the reproducer, the valve, which is then formed by the vibratory member, serving to set up undulations in the current of fluid passing therethrough in accordance with the sound waves to be reproduced.

Other objects of my invention include the production of a diaphragm so formed as to be capable of vibration in accordance with sound vibrations under atmospheric pressure and capable of opening more or less in accordance with sound vibrations to form a port for the passage of fluid therethrough under forced fluid pressure, and the construction and combinations of parts suit-

able for the production of the objects above enumerated.

These various objects may be attained by a number of constructions which are herein- 55 after described and specifically claimed.

Reference is hereby made to the accompanying drawings forming part of this specification, and in which—

Figure 1 is a side elevation, partly in section, of a sound reproducer embodying my form of my invention; Fig. 2 is a bottom plan view of the diaphragm or vibratory member employed in the same; Fig. 3 is a side elevation, partly in section, of a repro- 65 ducer embodying a second form of my device, Fig. 4 representing a top plan view of the vibratory member employed in the same; and Figs. 5 and 6 represent respectively a side elevation, partly in section, of 70 a reproducer embodying a third form of my device, and a bottom plan view of the vibratory member employed in the same.

Referring to the drawings and more particularly to Figs. 1 and 2, the sound repro- 75 ducer 1 is provided with a depending flange 2, within which is screw threaded the cylinder 3, the diaphragm or vibratory member 4 being clamped between gaskets 5 and 6, gasket 5 contacting shoulder 7 formed in flange 2 of reproducer body 1, cylinder 3 being screwed up within flange 2 to bind the parts firmly together. Diaphragm- 80 4 divides the interior of the sound box into two chambers 8 and 9. Air under pressure 85 may be forced within chamber 9 by means of air duct 10 although it is obvious that suction might be employed if desired in place of pressure for causing the passage of the moving fluid through the reproducer. 90 Chamber 9 is closed at its lower end by means of closure 11 through which passes link 12 which is secured to the rear end of stylus lever 13 which carries stylus 14, and is pivotally mounted at 15 to lugs 16 secured 95 to or integral with floating weight 17, which is pivoted at 18 to pivot block 19 which is secured to the lower end of cylinder 3 by any suitable means, as the vertical screw 20. The diaphragm 4 is preferably 100 formed of a flat plate of glass and is slit transversely and diametrically as shown at



21. This slit is formed in the diaphragm after the latter has been secured in place within the reproducer by means of a diamond or other suitable cutting agent, the slit or crack being closed when the diaphragm is at rest. As shown in Fig. 2, the slit or crack 21 extends across the entire diaphragm. The link 12 is connected to the diaphragm on either side of the crack or slit, as indicated at 22.

In the operation of the device, the diaphragm 4 may be vibrated as a simple diaphragm by connection through link 12 with stylus 14 whenever it is desired to reproduce in the ordinary manner, that is, without the passage of a moving fluid through the reproducer. In this case, the crack 21 remains quite tight and does not interfere perceptibly with the vibration of the diaphragm or with the reproduction of sound caused by the vibration of the same. Whenever it is desired to operate the device as a pneumatic sound box, however, the pressure of air or other fluid on the lower side of the diaphragm tends to flex the diaphragm upward, opening slightly crack 21 and affording a passageway therethrough for the moving fluid. This opening is varied more or less in accordance with the sound waves to be reproduced by the connection between the diaphragm and the stylus above described. Thus, undulations are impressed upon the fluid moving through slit 21 corresponding to sound vibrations to be reproduced.

Referring more particularly to Figs. 3 and 4 of the drawings, the vibratory member or diaphragm is formed in the following manner:—Elastic plates 4' and 4<sup>2</sup> are supported from opposite sides of the sound box between gaskets 5 and 6, the parts being secured in place between shoulder 7 of sound box 1 and cylinder 3 in the same manner as described in connection with Figs. 1 and 2. Elastic plates 4' and 4<sup>2</sup> are each sections or segments of a diaphragm having inner unsupported edges constituting chords of the circle less than the diameter, these unsupported edges 23 and 24 being preferably parallel. A third elastic plate 4<sup>3</sup> rests upon the unsupported edges 23 and 24 of plates 4' and 4<sup>2</sup> overlapping said edges to cover the opening therebetween. This plate 4<sup>3</sup> is of elastic material, preferably the same of which plates 4' and 4<sup>2</sup> are formed, and is bounded preferably by chords of the circle parallel to edges 23 and 24 of plates 4' and 4<sup>2</sup> and slightly shorter than chords 23 and 24 since the plate 4<sup>3</sup> overlaps both plates 4' and 4<sup>2</sup>. Plate 4<sup>3</sup> is bounded at its edges 25 and 26 by arcs of the circle which form the supported periphery of plates 4' and 4<sup>2</sup>, plate 4<sup>3</sup> being held at these edges by gasket 5. The link 12' is connected to plate 4<sup>3</sup> at its central point, as indicated, link 12' being connected

to stylus 14 in the manner described in connection with Figs. 1 and 2.

In the operation of this device when the reproducer is operated as a simple reproducer without the passage of fluid there-through, elastic plates 4', 4<sup>2</sup> and 4<sup>3</sup> vibrate together to form a simple reproducer the vibrations of which cause the desired reproduction. In this operation the elasticity of plates 4' and 4<sup>2</sup> cause them to follow the plate 4<sup>3</sup> in its upward movement when stylus 14 descends within depressions in the record, plate 4<sup>3</sup> forcing plates 4' and 4<sup>2</sup> downward when plate 4<sup>3</sup> descends in obedience to the passage of stylus 14 over elevations in the record. When, however, the device is used as a pneumatic reproducer, pressure of the moving fluid upon the lower surface of plate 4<sup>3</sup> causes a slight opening between plate 4<sup>3</sup> and plates 4' and 4<sup>2</sup> along edges 23 and 24. The amount of this opening varies with the movements of stylus 14 along the record groove and the undulations impressed upon the current moving through the passages formed along edges 23 and 24 vary accordingly.

Referring more particularly to Figs. 5 and 6 of the drawings, the diaphragm or vibrating body in this form of my invention is formed of two plates 4<sup>5</sup> and 4<sup>6</sup> of elastic material, which are supported in the sound box on opposite sides thereof between the gaskets 5 and 6. These plates 4<sup>5</sup> and 4<sup>6</sup> are similar to plates 4' and 4<sup>2</sup> in the last described form of my invention, except that one of the plates, as 4<sup>5</sup>, overlaps the other, as 4<sup>6</sup>, at its inner or unsupported edge. That is to say, the plates 4<sup>5</sup> and 4<sup>6</sup> comprise segments of a circle supported at the periphery between gaskets 5 and 6 and bounded at their inner unsupported edges 27 and 28 by chords of the circle which are preferably parallel, the plates 4<sup>5</sup> and 4<sup>6</sup> extending across the center of the circle. The link 12<sup>2</sup>, which is connected to the stylus lever 13 which bears stylus 14 as in the previous figures, is secured to the lower side of plate 4<sup>6</sup> near the edge 28 thereof. The overlapping edge of plate 4<sup>5</sup> lies snugly upon the outer surface of plate 4<sup>6</sup>, the two plates being mounted in parallel relation, and when the reproducer is operated without the flow of a current of air or other fluid therethrough, the plates 4<sup>5</sup> and 4<sup>6</sup> vibrate together as a simple diaphragm, the elasticity of plate 4<sup>5</sup> causing it to follow the plate 4<sup>6</sup> downwardly when the latter is vibrated downwardly, because of the movement of stylus 14 over elevations in the sound record. When, however, the device is operated as a pneumatic reproducer, the pressure of moving fluid forced into chamber 9 from pipe 10 upon the lower surface of plate 4<sup>5</sup> causes the upward flexure of plate 4<sup>5</sup> to a sufficient extent to permit the

passage of air across edge 28 from chamber 9 into chamber 8 through an opening between the two plates 4<sup>5</sup> and 4<sup>6</sup>, the amount of which opening varies in accordance with the sound vibrations to be reproduced.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. In a sound reproducer, the combination with a sound box of a flat divided diaphragm supported within the same, and means for vibrating said diaphragm in accordance with sound vibrations under conditions of normal pressure and for causing said diaphragm to open more or less to permit the passage of fluid therethrough in accordance with sound vibrations, under conditions of abnormal pressure, substantially as described.

2. In a sound reproducer, a flat diaphragm capable of vibration in accordance with sound vibrations under atmospheric pressure, and capable of opening more or less in accordance with sound vibrations to form a port for the passage of fluid therethrough under forced fluid pressure, substantially as described.

3. In a sound reproducer, a flat diaphragm formed of a plurality of parts adapted to act as a simple diaphragm under normal atmospheric pressure, but to act as a valve under abnormal or forced fluid pressure, substantially as described.

4. In a sound reproducer, the combination with a sound box of a diaphragm of elastic material supported within the same and formed of a plurality of parts supported and fitting together in contact throughout their adjacent edges so as to vibrate as a diaphragm under normal pressure, but said parts being adapted to separate to form a port opening under forced pressure, and means for vibrating said diaphragm under normal pressure or causing said parts to separate more or less under forced fluid pressure, in either case in accordance with sound vibrations, substantially as described.

5. In a sound reproducer, the combination with a sound box of a diaphragm supported within and dividing the same into two chambers, said diaphragm being of elastic material and being slit across the same, and means for flexing said diaphragm in accordance with sound vibrations to cause said diaphragm to open at said slit to a greater or less extent, said diaphragm when at rest having no openings therein, substantially as described.

6. In a sound reproducer, the combination with a sound box of a diaphragm supported within the same, said diaphragm being of elastic material and slit transversely, said slit being closed when said diaphragm is in normal position, and means for flexing said diaphragm in accordance with sound vibra-

tions to cause said slit to open to a greater or less extent to form a passageway for a fluid passing therethrough, substantially as described.

7. In a sound reproducer, the combination with a sound box of a diaphragm supported within and dividing the same into two chambers, said diaphragm being of elastic material and being slit transversely, said slit being closed when said diaphragm is in normal position, means for introducing fluid under pressure into one of said chambers, and means for flexing said diaphragm in accordance with sound vibrations to cause said slit to open to a greater or less extent to throw said fluid passing through said slit into vibrations corresponding to said sound vibrations, substantially as described.

8. In a sound reproducer, a sound box, a diaphragm supported within said box, said diaphragm being slit transversely and so held that said slit is normally closed, but is adapted to be opened slightly on flexure of said diaphragm, substantially as described.

9. In a sound reproducer, the combination with a sound box of a diaphragm supported within and dividing the same into two chambers, said diaphragm being of elastic material and being slit transversely, said slit being closed when said diaphragm is in normal position, means for introducing fluid under pressure into one of said chambers, a pivoted stylus lever and stylus carried thereby, and a connection from said lever to said diaphragm attached to the latter adjacent said slit, substantially as described.

10. In a sound reproducer, the combination with a sound box of a diaphragm supported within and dividing the same into two chambers, said diaphragm being of elastic material and being composed of a plurality of members so held and positioned as to prevent communication between said chambers when at rest, and to vibrate as a diaphragm when connected under normal pressure to a reproducing stylus, but adapted to separate and allow the passage of fluid between said chambers in greater or less degree when thus connected under forced fluid pressure, means for introducing fluid under pressure into one of said chambers, a stylus lever and stylus carried thereby, and connections from said lever to said diaphragm, substantially as described.

11. In a sound reproducer, the combination with a sound box of elastic means dividing the same into two chambers, means for introducing fluid under pressure into one of said chambers, said elastic means being normally closed but adapted to open under forced pressure to form a passageway therethrough, and means for reproducing sound by vibrating said elastic means under normal pressure or by causing said



elastic means to open more or less under forced pressure and thus setting up vibrations in the fluid passing therethrough, in accordance with sound vibrations, substantially as described.

12. In a sound reproducer, the combination with a sound box, of a flat dividing diaphragm supported within the same, and means for vibrating said diaphragm in accordance with sound vibrations under conditions of normal pressure, and for causing said diaphragm to open more or less to permit the passage of fluid therethrough in accordance with sound vibrations under conditions of abnormal pressure, said diaphragm when at rest having no openings therein, substantially as described.

13. In a sound reproducer, a flat diaphragm capable of vibration in accordance with sound vibrations under atmospheric pressure, and capable of opening more or less in accordance with sound vibrations to

form a port for the passage of fluid therethrough under forced fluid pressure, said diaphragm when at rest having no openings or ports therein, substantially as described.

14. In a sound reproducer, in combination with a sound box, of a diaphragm supported within and dividing the same into two chambers, said diaphragm being of elastic material and being slit entirely across the same, and means for flexing said diaphragm in accordance with sound vibrations to cause said diaphragm to open at said slit to a greater or less extent, said diaphragm when at rest having no openings therein, substantially as described.

This specification signed and witnessed this 10th day of September 1909.

ALEXANDER N. PIERMAN.

Witnesses:

DYER SMITH,  
JOHN M. CANFIELD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

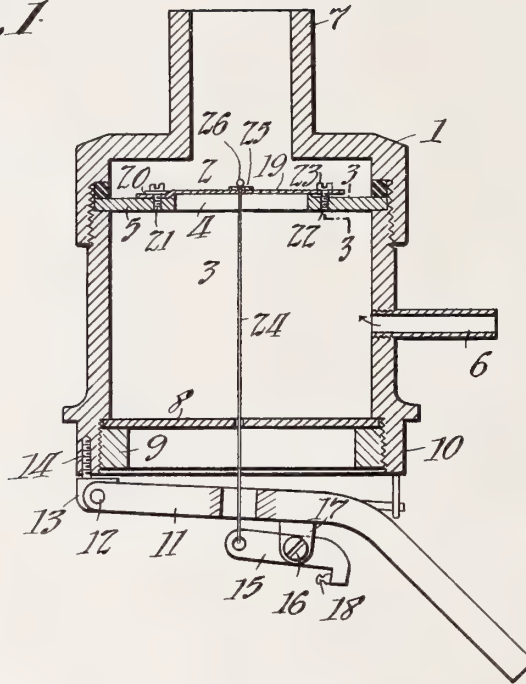


A. N. PIERMAN.  
 PHONOGRAPH REPRODUCER.  
 APPLICATION FILED SEPT. 18, 1909.

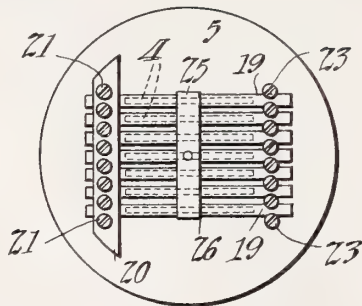
1,024,697.

Patented Apr. 30, 1912.

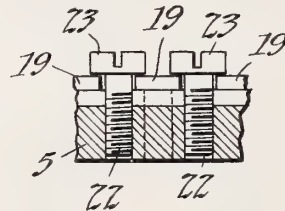
*Fig. 1*



*Fig. 2*



*Fig. 3*



*Witnesses:*  
 Frank Shew  
 Dyer Smith

*Inventor:*  
 Alexander M. Pierman  
 by Frank L. Egan  
 Atty.

# UNITED STATES PATENT OFFICE.

ALEXANDER N. PIERMAN, OF NEWARK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH-REPRODUCER.

1,024,697.

Specification of Letters Patent.

Patented Apr. 30, 1912.

Application filed September 18, 1909. Serial No. 518,415.

*To all whom it may concern:*

Be it known that I, ALEXANDER N. PIERMAN, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Reproducers, of which the following is a description.

My invention relates to phonograph reproducers of the pneumatic type, or, generally speaking, of the type in which undulations corresponding to sound waves are impressed upon a current of any suitable moving fluid by the operation of a suitable valve through which the fluid is allowed or caused to pass, the valve being operated in accordance with the sound waves as by connection with a reproducing stylus tracking a record groove. I filed in the United States Patent Office an application Serial No. 493,281 on May 1, 1909 in which I disclose and claim broadly a phonograph reproducer of this general type in which the valve or vibratory member or members were of minimum mass, whereby defects due to inertia and momentum of parts are largely avoided. In the application referred to, thin, reed-like members are interposed in the path of the moving fluid current and are vibrated in accordance with sound vibrations to be reproduced to set up corresponding undulations in the moving fluid current passing through the sound box. Specifically, in the application referred to a port plate is provided having one or more slit-like ports therein upon which are seated the thin, reed-like members which are placed under tension and secured rigidly to the port plate at both ends. These members are joined together and flexed by connection with the stylus to vary the extent of opening of the ports to a greater or less extent.

My present invention constitutes an improvement upon the invention of the application referred to, the improvement residing in the manner of mounting the elastic reed-like members upon the port plate.

The object of my invention is to improve the quality of sound reproduction of a device of this character.

Reference is hereby made to the accompanying drawings forming part of this specification, in which the same reference

numerals are used throughout to denote corresponding parts, and in which—

Figure 1 is a side elevation, partly in section, of a sound reproducer embodying my invention. Fig. 2 is a plan view of the port plate with the valve members secured thereto. Fig. 3 is an enlarged cross section on line 3—3 of Fig. 1.

Referring to the drawings, the sound box 1 may be formed with the two chambers 2 and 3 communicating through the ports 4 in the port plate 5, air being conducted into the chamber 3 by means of a conduit 6 and escaping from chamber 2 through the reproducer neck 7. The chamber 3 is closed by the closure 8 which is secured in position against the shoulder of the circular wall of the chamber 3 by means of the ring 9 which is screwed into the depending flange 10 of the sound box to hold the closure 8 tightly in position. The floating weight 11 is pivotally mounted at 12 to the block 13 which is mounted as by screw 14 on the lower surface of the depending flange 10. The stylus lever 15 is pivotally mounted at 16 to the lugs 17 depending from the floating weight, and the said stylus lever is provided with stylus 18. All of the above mentioned parts are common.

The ports 4, which are preferably in the form of lengthened slits are normally closed by means of the flexible reed-like members 19 seated upon the same. These members are very thin and preferably are formed of a light metal such as aluminium. These reeds are secured in position on the port plate by the following means:—Preferably, the strip 20 is placed transversely across the ends of reeds 19 beyond one extremity of the ports 4 and screws 21 are screwed through the strip 20 and into the port plate 5, the shanks of the screws extending between the reed-like members 19 and the heads of the screws each overlapping one of the said reeds 19 on each side of the same. These screws are screwed down tightly to secure the reeds 19 rigidly to the port plate at that end of the said reeds. By this means a very secure connection is made which is at the same time detachable. It is, of course, obvious that members 19 might be secured permanently to the plate 5 at one end by any other suitable means, as by soldering the



same at that end to the port plate. At the other end of the reeds 19 screws 22 are screwed in to the port plate 5 in the same relation to the reeds 19 as are the screws 21 at the other end of the same, that is to say, each reed 19 has one screw 22 on each side of the same, the heads 23 of the screws 22 each overlapping one of the said reeds 19 on each side of the same. Screws 22, however, are not screwed in sufficiently far to bind reeds 19 rigidly to port plate 5 at their end of the reeds. Instead, screws 22 are so adjusted that reeds 19 may slip or move somewhat longitudinally under heads 23 of screws 22 when the said reeds 19 are flexed.

Stylus 18 is connected to reeds 19 by any suitable means, as the link 24, which is connected at its lower end to the tail of stylus lever 15, and at its upper end to the reeds 19. Preferably, reeds 19 are fastened together as by means of strip 25 which is soldered or otherwise secured to the same transversely of the same midway between screws 21 and 22. Link 24 is secured to this strip 25. I prefer to use the construction shown in the drawings in which link 24 passes through a hole in strip 25 and is provided on the upper side thereof with a button or head 26 so that the upward movement of stylus 18 in tracking the record groove pulls the reeds 19 downwardly at their central points, the pressure of air or other fluid passing from chamber 3 through ports 4 into chamber 2 tending to constantly keep the reeds 19 flexed upwardly. In the operation of the device, reeds 19 operate entirely by flexure in accordance with the sound vibrations to be reproduced, the reeds being held rigidly at the one end and slipping slightly forward and back under screw heads 23 at the other end, the reeds flexing symmetrically under the opposing forces of the current fluid and the central pull of the link 24 on the same.

It is obvious that the proportions of parts as shown could be changed without departing from the spirit of the invention, and that, if desired, the direction of flow of the fluid could be reversed and the valve seated upon the opposite side of port plate 5 from that indicated with appropriate connection to the stylus lever, and that also, if desired, the reed-like members could be seated upon the lower side of port plate 5 instead of upon the upper side as indicated in the drawings.

Where, in the claims, I have referred to members seated upon the ports, it is to be understood that I do not limit myself to the seating of the members upon the upper surface of the port plate merely.

The valve as constructed is exceedingly sensitive and copies the vibrations of the stylus with amplification and with great faithfulness. Any desired number of ports

and corresponding reeds may be used, the loudness of the sound reproduced varying with the number of reeds employed.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. In a sound reproducer, the combination of a hollow body containing chambers communicating through a plurality of ports, members of elastic material seated upon and covering said ports, means for holding rigidly one extremity of said members, means located at the other extremity of said members for preventing all except longitudinal movement of said extremity, and permitting longitudinal movement, and means for flexing the said members in accordance with sound vibrations, substantially as described.

2. In a sound reproducer, the combination of a hollow body containing chambers communicating through a port, a member of elastic material seated upon and covering said port, means for holding rigidly one extremity of said member, means located at the other extremity of said member for restricting all movement of said extremity to movement in the plane normally occupied by said member and means for flexing said member in accordance with sound vibrations, substantially as described.

3. In a sound reproducer, the combination with a sound box and means for conveying a fluid therethrough, of a vibratory thin strip interposed in the path of said fluid and held rigidly at one end, means located adjacent the other end of said strip for restricting all movement of said end to movement in the plane normally occupied by said strip, and means for flexing said strip in accordance with sound vibrations to be reproduced, to produce corresponding undulations in said fluid, substantially as described.

4. In a sound reproducer, the combination with a sound box and means for conveying a fluid therethrough, of a vibratory thin strip interposed in the path of said fluid, means holding said strip rigidly at one end, means located adjacent the other end of said strip for restricting all movement of said strip to movement longitudinal of said member, and means acting upon said strip substantially midway between said holding and restricting means for causing the same to flex in accordance with sound vibrations to be reproduced, to produce corresponding undulations in said fluid, substantially as described.

5. In a sound reproducer, the combination with a sound box and means for conveying a fluid therethrough, of flexible means interposed in the path of said fluid for producing undulations therein by its flexure, means permitting slip of said flexible means at one end thereof in the plane normally occupied

by said flexible means, but preventing all other movement of said end, and means for flexing the said flexible means in accordance with sound vibrations, substantially as described.

5  
6. In a sound reproducer, the combination with a port plate provided with a port, of a thin flexible strip seated upon and covering said port, means holding said strip adjacent the ends constructed to permit longitudinal movement of said strip past said holding means during flexure but to prevent all other movement of said strip adjacent its ends, and means for flexing said strip in accordance with sound vibrations, substantially as described.

10  
15  
20  
7. In a sound reproducer, the combination with a port plate provided with a port, of a thin reed-like member of elastic material, seated upon and covering said port, means for securing said member rigidly at one end, means for preventing the lifting of the other end of said member from its seat but permitting longitudinal movement thereof past

said preventing means, and means for flex- 25  
ing said member in accordance with sound vibrations, substantially as described.

8. In a sound reproducer, the combination with a port plate provided with a port, of a thin reed-like member of elastic material, 30  
seated upon and covering said port, means for securing said member rigidly at one end, a headed body inserted in said port plate adjacent the other end of said member and having its head bearing upon said member 35  
with sufficient force to prevent lifting of the same from its seat, but to permit longitudinal movement thereof under said head, and means for flexing said member in accordance with sound vibrations, substantially as de- 40  
scribed.

This specification signed and witnessed this 16th day of September 1909.

ALEXANDER N. PIERMAN.

Witnesses:

DYER SMITH,

JOHN M. CANFIELD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."



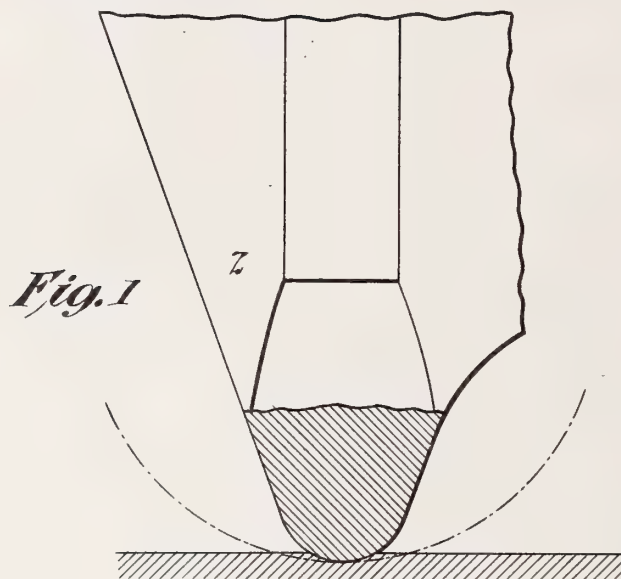




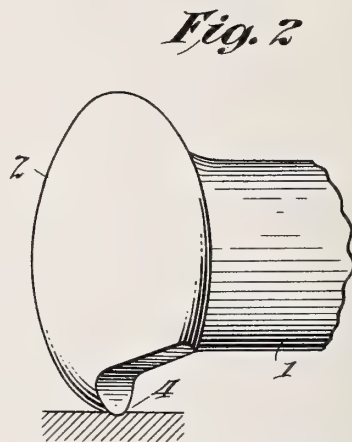
T. A. EDISON.  
 PHONOGRAPHIC RECORDING STYLUS.  
 APPLICATION FILED JAN. 3, 1907. RENEWED OCT. 7, 1909.

1,024,839.

Patented Apr. 30, 1912.

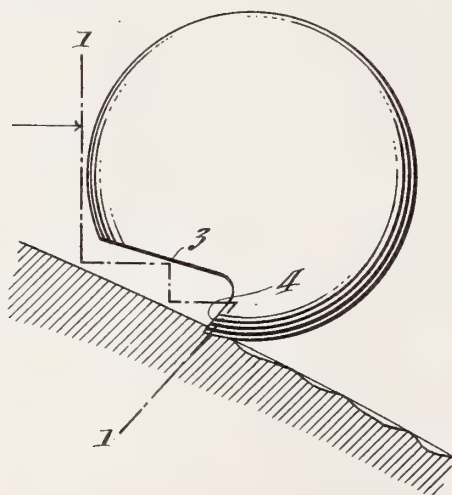


*Fig. 1*

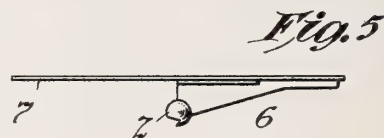


*Fig. 2*

*Fig. 3*

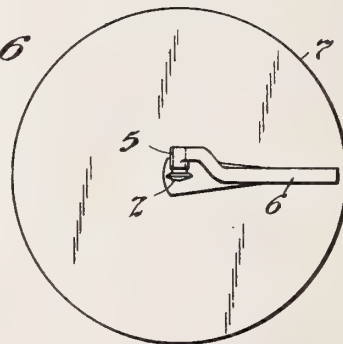


*Fig. 4*



*Fig. 5*

*Fig. 6*



**Witnesses:**

Francis D. Lewis  
 Delos Holden

**Inventor:**

Thomas A. Edison  
 by Frank L. Spier  
 Atty.

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPHIC RECORDING-STYLUS.

1,024,839.

Specification of Letters Patent.

Patented Apr. 30, 1912.

Application filed January 3, 1907, Serial No. 350,647. Renewed October 7, 1909. Serial No. 521,490.

*To all whom it may concern:*

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, residing at Llewellyn Park, Orange, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographic Recording-Styli, of which the following is a description.

My invention relates to an improved phonographic recording stylus, and my object is to provide a device for the purpose in which a very perfect curved cutting edge can be formed of very small diameter.

At the present time the available path on the blank for the accommodation of the record is one one-hundredth of an inch (.01"), since this is the standard pitch originally proposed by me and now adopted universally by talking machine manufacturers. The recorders at present used present a substantially circular cutting edge the diameter of which is about four one-hundredths of an inch (.04"). I now propose to make phonograph records with a pitch of two hundred threads per inch, the advantages of which are explained in an application for Letters Patent filed on even date herewith.

In order to form a record in a path one-half as wide as that now presented, and of the same depth as that now formed, the recording stylus should not, as might be supposed, be one-half the diameter, but it is necessary that it should be substantially one-fourth the diameter of that now employed, namely, about one one-hundredth of an inch. Even in the manufacture of a recording stylus four one-hundredths of an inch in diameter the operation is a difficult one, requiring labor of the highest skill, machines of great delicacy of adjustment and construction, and most of the operations have to be performed under the microscope. Yet with these precautions there is very considerable loss by breakage, since the material used, sapphire, although extremely hard, is very brittle and of little bodily strength, so that it chips and cracks readily. To attempt to form a recording stylus only one one-hundredth of an inch in diameter of this material by present processes and machines, and of the present type or form, might be possible as a mechanical phenomenon, but I do not believe it can ever be done in a com-

mercially practical way. I have therefore sought to modify the shape of the recording stylus whereby it may be readily made with a cutting edge of smaller diameter and at the same time its shape will be such that the production of sharp angles is avoided, and sufficient material always presented to reduce cracking or chipping to a minimum.

My improved recording stylus comprises a shank on the end of which is formed a circular or parti-circular head somewhat like the head of a pin, whose periphery presents in cross section the proper curve for the cutting edge, and the head is cut away or notched to result in the production of a cutting edge somewhat similar to that employed on an enormously larger scale in a shape tool. The stylus so obtained is mounted in a suitable socket so that the cutting edge will be properly presented to the blank, and is carried by or affixed to the diaphragm in any suitable way.

In order that the invention may be better understood, attention is directed to the accompanying drawings forming part of this specification, and in which—

Figure 1 is a sectional view on the line 1—1 of Fig. 3, at the cutting edge of the improved stylus showing the same greatly enlarged, and illustrating by dotted lines the relative shape of recorders now used having a diameter of four one-hundredths of an inch; Fig. 2, a perspective view of the improved stylus enlarged to one-fourth the scale of Fig. 1; Fig. 3, a front view of the same on the same scale at Fig. 2, and showing the stylus engaging a blank; Fig. 4, an end view of the stylus on a smaller scale, showing the same mounted on a diaphragm; Fig. 5, a front view of the same, and Fig. 6 a plan view of the same.

In these views corresponding parts are represented by the same numerals of reference.

The stylus, as heretofore, is made preferably of sapphire. It is formed with a shank 1 about five one-hundredths of an inch in diameter and of any suitable length, say,  $\frac{3}{8}$ ". At its end it is turned with a button shaped head 2 of somewhat larger diameter, say, about nine one-hundredths of an inch. As shown in Fig. 1, this head is tapered toward its periphery so as to make a strong and readily formed construction which can

be produced in a small lathe. The periphery of the head 2 is formed with a curve which in cross section presents substantially the shape desired for the cutting edge.

5 This curve is not mathematically the exact shape of the cutting edge for the reason that in forming the latter the head 2 is not cut way on a diametric line, and consequently the form of the cutting edge will be slightly more elliptical than a true section through the head 2. The head 2 is notched or cut away at 3 to form the cutting edge 4 which can be done by a suitable rotating tool. In forming this notched or cut-away portion the material is not removed at the angle thereof, but a curve is presented (see Fig. 3) to reduce to a minimum chipping or breaking in this operation. In mounting the improved stylus, the shank 1 is received and tightly secured by cement, or otherwise, in a suitable socket 5, which may be carried by a light frame 6 cemented to the diaphragm 7. It will be obvious that my improved recording stylus, although it presents a cutting edge of extremely small diameter, does not involve operations any more delicate than those now performed in making a stylus which is in fact four times as large, and at the same time the material is so disposed that there is no greater danger of cracking or breaking than in the manufacture of a stylus of the existing standard.

35 In Fig. 1, I illustrate diagrammatically a comparison between my improved stylus whose cutting edge presents substantially a circle one one-hundredth of an inch in diameter, and a stylus as now constructed whose cutting edge presents a circle four one-hundredths of an inch in diameter. It will be seen that although the former is only about one-fourth the diameter of the latter, yet

in cutting to the same depth it occupies one-half the width of the blank.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is as follows:

1. A recording stylus comprising a disk-like head having a curved periphery formed with a notch therein to present a cutting edge, the plane surface of which is transverse to the plane of said periphery, substantially as set forth.

2. A recording stylus comprising a disk-like head with a notch cut in said head said notch being formed with two converging substantially plane surfaces connected by a curved surface, substantially as set forth.

3. A recording stylus comprising a shank and a disk-shaped head increasing in thickness from its periphery toward its center and formed with a notch presenting a curved cutting edge, substantially as set forth.

4. A recording stylus consisting of a jewel having a rounded periphery and formed with a notch which presents a substantially circular cutting edge having a diameter of less than two one-hundredths of an inch, substantially as set forth.

5. A recording stylus consisting of a jewel formed with a shank and a disk-shaped head which increases in thickness from its periphery toward its center, said head being formed with a notch which presents a substantially circular cutting edge having a diameter of less than two one-hundredths of an inch, substantially as set forth.

This specification signed and witnessed this 28th day of December 1906.

THOS. A. EDISON.

Witnesses:

FRANK L. DYER,  
ANNA R. KLEHM.

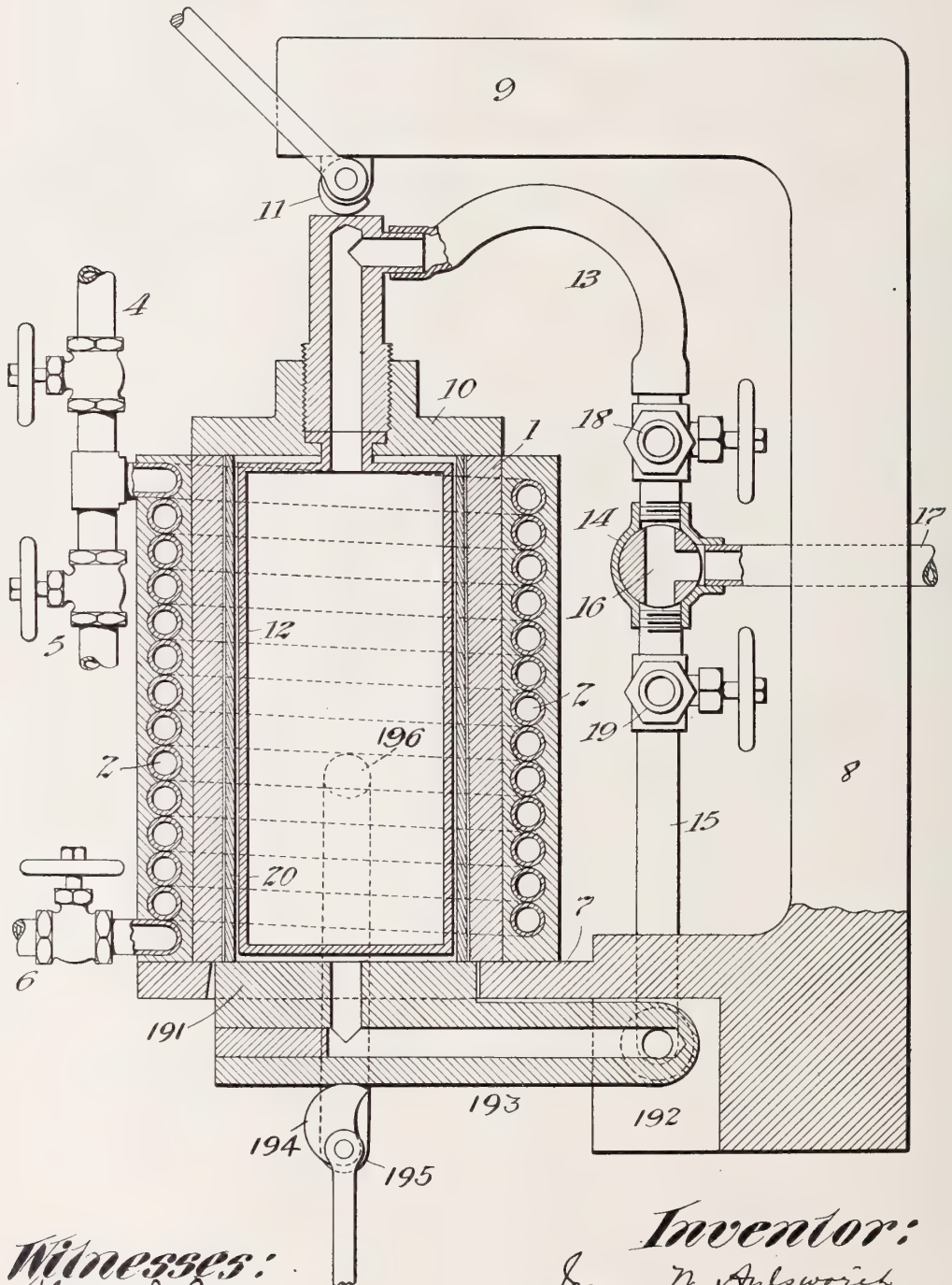




J. W. AYLSWORTH.  
 APPARATUS FOR DUPLICATING SOUND RECORDS.  
 APPLICATION FILED SEPT. 11, 1907.

1,024,965.

Patented Apr. 30, 1912.



*Witnesses:*  
 Frank O Lewis  
 H N Dyke

*Inventor:*  
 Jonas W. Aylsworth  
 by Frank L. Green *Atty.*

# UNITED STATES PATENT OFFICE.

JONAS W. AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## APPARATUS FOR DUPLICATING SOUND-RECORDS.

1,024,965.

Specification of Letters Patent.

Patented Apr. 30, 1912.

Original application filed December 6, 1905, Serial No. 290,540. Divided and this application filed September 11, 1907. Serial No. 392,250.

*To all whom it may concern:*

Be it known that I, JONAS W. AYLSWORTH, a citizen of the United States, residing at 223 Midland avenue, East Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Duplicating Sound-Records, of which the following is a specification.

This application is a division of an application filed December 6th, 1905, Serial No. 290,540, on which Patent No. 871,554 was granted November 19, 1907.

My invention relates to an improved apparatus for duplicating sound records from matrices or molds by the expansion of a blank, and is adapted particularly for the making of records from relatively hard material, such as hard rubber, celluloid and similar composition, although the invention may be used for making records from wax-like compositions, such as those now employed in the art of making duplicate phonograph records by a molding operation.

The object of my invention is to provide a simple and effective apparatus for the purpose.

In order that the invention may be better understood, attention is directed to the accompanying drawing, forming part of this specification and in which I illustrate a sectional view of an apparatus constructed in accordance with my invention.

The matrix or mold 1 is of the common type now used in the art, being provided on its interior with a negative impression of the record to be duplicated and being of any desired thickness. Provision is made for alternately heating and cooling the matrix or mold, preferably by surrounding the same with a coil 2, embedded in a jacket of lead, or other fusible metal. Steam (saturated or super-heated) for heating the coil, or water for cooling the same, is admitted through the pipes 4 and 5 respectively, said pipes having suitable controlling valves therein, as shown. The valved outlet 6, permits any water or condensed steam to be drawn off from the coil at the bottom thereof. The matrix or mold is seated on a suitable base 7, and may, if desired, be permanently connected to the same, and said base is carried by a frame 8 hav-

ing an upper member or arm 9. Engaging the top of the mold is a cap 10 adapted to be firmly clamped in place in any suitable way, as for example, by a cam 11, carried by the arm 9. The cap 10, is provided with a flexible expander 12, made preferably of rubber, adapted to fit within the matrix or mold, and to leave sufficient space for the reception of the blank on which the record surface is to be impressed. Connected with the interior of the expander 12, is a flexible pipe 13, leading to the chamber 14 of the vacuum valve. A pipe 15 connects the interior of the matrix or mold with the chamber 14. The vacuum valve 16 is an ordinary three-way valve and when in the position shown, connects the vacuum pipe 17 with the pipes 13 and 15, so as to exhaust the air from the mold and from the interior of the expander 12. When the vacuum valve is moved 90 degrees clockwise, it connects the vacuum pipe 17 with the pipe 15 only, and when moved to a further extent of 90 degrees, it cuts off the vacuum pipe 17 entirely, as will be understood. The vacuum pipe 17 is connected to any suitable source of vacuum, preferably an ordinary exhausting pump. To provide regularity and rapidity of operation, a reservoir is preferably interposed between the exhausting pump and the duplicating apparatus, so as to permit the necessary exhaustion to be quickly obtained, and also to permit a number of duplicating machines to be connected with the same reservoir, as will be understood. A valved pipe 18 connects with the pipe 13 above the vacuum valve and may be open directly to the air or may be connected with a source of compressed air, as may be necessary when the materials to be duplicated are but slightly expansible. Another valve 19 below the vacuum valve permits atmospheric air to enter the pipe 15.

The blank 20 may be made of any suitable material capable of being softened or rendered plastic or semi-fluid by heating (such as hard rubber, celluloid, shellac composition, or the ordinary wax-like materials of which duplicate phonograph records are now made) and of any desired thickness.

By means of my invention, records can be effectively duplicated on extremely thin



blanks, which can be subsequently mounted on any suitable and permanent support, as for instance, by making the blank slightly tapered, so as to engage the support frictionally. Or, instead, the blank may be a composite structure formed of a suitable base of paper, fabric, rubber composition, or similar material capable of moderate expansion without rupture, and carrying a coating of a smooth and sufficiently hard material (such as celluloid or similar substance, capable of being softened by heat) on its outer surface.

Preferably the bottom of the mold is constructed so as to swing downwardly to permit the blank to be introduced, and the finished record to be withdrawn, suitable means being provided to rigidly lock the bottom in its closed position during the duplicating operation. In the construction shown, the bottom 191 of the mold is hinged to the support 7 at 192, the pipe 15 communicating with the passage 193 therein by an ordinary swivel connection, as will be understood, so that the bottom may be swung down without interfering with the connection between the pipe 15 and the passage 193. The bottom 191 is supported when the mold is closed by the locking cam 194, which is rotatably mounted on the swinging yoke 195 which is pivoted at its upper ends as shown at 196, and may be swung out of the way to permit the bottom 191 to be swung downward upon its hinge. The blank 20 is made very slightly smaller than the bore of the matrix or mold so as to be readily introduced therein surrounding the expander, as shown. The matrix or mold is now heated (or it may be heated before the blank is introduced) by admitting the steam to the coil 2 or in any other suitable way. This results in heating the blank so as to soften its outer face and permit it to readily take an impression. During the heating of the blank, the vacuum valve 16 is operated to exhaust air from the interior of the expander 12, and also, from the interior of the mold, so as to equalize the pressure on the expansible walls of the expander. By thus applying a vacuum to the interior of the matrix or mold, I effectively exhaust any air, or gas, or moisture from between the blank and the record surface of the matrix, so that when the blank is expanded it will take a perfectly clear and sharp impression from the record surface. Furthermore, this exhaustion of the air film between the blank and matrix is effected without the necessity of sealing the ends of the blanks in any way and the result is obtained whether the blank is relatively thick or is very thin. The vacuum valve 16 is now moved clock-wise 90 degrees, so as to still maintain the exhaust connection to the pipe 15, and the valve of the pipe 18 is open to permit atmospheric

air or compressed air to enter the expander 12, thereby expanding the flexible walls of the latter and forcing the blank intimately into engagement with the record surface. When the blanks are formed of material that is expanded with difficulty, or that softens only slightly, I preferably use compressed air in the expander, or superheated steam in the coil 2, or both, for effecting this operation, but with thin blanks of celluloid, or similar material, atmospheric pressure will be sufficient. After the blank has been thus expanded into engagement with the matrix and is held closely in such engagement by the inflation of the expander 12, I turn off the steam in the coil 2 and admit cold water to the same, so as to rapidly chill the matrix and also the surface of the record in contact therewith. This chilling takes place while the record is tightly compressed against the bore of the matrix, so that the material is set and becomes fixed while in such engagement. This results in a sharper and more permanent impression on the resulting duplicate than would be secured if the setting of the material was brought about after detachment of the record from the mold. Preferably, before the record has been cooled entirely throughout, but after its surface has been set and hardened as explained, the vacuum valve 16 is moved to shut off the vacuum pipe 17, and the valve 19 is opened to equalize the pressure on the walls of the expander 12, the elasticity of whose walls withdraws the expander from the record to its normal size. The mold with the record therein is now allowed to cool (or an artificial cooling operation may be performed) whereby the record will contract diametrically so as to free itself from the matrix and be allowed to be removed by swinging the mold bottom downwardly. This separation of the finished duplicate from the matrix will be facilitated if the bore of the matrix is formed with a very slight taper, as is common in the art.

Although I have referred in the preceding description to the use of a vacuum, it will be understood that I use the expression in its typical sense and mean any such condition of rarefaction as can be commercially secured by a well designed exhausting or vacuum pump.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is as follows:

1. Apparatus for duplicating phonograph records comprising in combination a matrix or mold, means for closing the ends thereof, a flexible expander therein, and means whereby air may be exhausted from the interior of the matrix or mold, substantially as set forth.

2. Apparatus for duplicating phonograph records comprising in combination a matrix

or mold, a hollow inflatable expander therein, and means whereby air may be exhausted from the interior of the expander and from the interior of the mold, substantially as set forth.

3. Apparatus for duplicating phonograph records, comprising a matrix or mold, a flexible expander therein, means whereby the air may be exhausted from the expander and matrix, and means for admitting pressure to the expander while maintaining the exhausted condition within the matrix, substantially as set forth.

4. Apparatus for duplicating phonograph records, comprising a matrix or mold, means for closing the ends thereof, means for heating and cooling the same, a flexible expander within the matrix or mold, and means whereby the air may be exhausted from the matrix or mold, substantially as set forth.

5. Apparatus for duplicating phonograph records, comprising a matrix or mold, a heating and cooling pipe surrounding the same and embedded in a fusible metal jacket, and a flexible expander within the matrix or mold, substantially as set forth.

6. In an apparatus for duplicating phonograph records, a hollow cylindrical matrix, means for closing the ends thereof, a flexible expander therein, and means surrounding the mold for heating or cooling the same, substantially as set forth.

7. In an apparatus for duplicating phonograph records, a hollow cylindrical matrix or mold, an expander centrally supported therewithin and so mounted as to permit the free insertion of a blank between the matrix and the expander and the free removal of a completed record therefrom without removing any of the apparatus, substantially as set forth.

8. In an apparatus for duplicating phonograph records, the combination of a hollow matrix or mold, a closure for one end thereof, an expander in said mold and supported by said closure, a swinging closure for the opposite end of the mold, and means for locking said last named closure in place to close the mold, substantially as set forth.

9. In an apparatus for duplicating phonograph records, the combination of a hollow matrix or mold, a hollow flexible expander therein, a conduit which may be made to communicate with both the interior of the expander and with the space between the expander and the interior of the matrix, and means whereby the air may be exhausted from said conduit and the spaces communicating therewith, substantially as set forth.

10. In an apparatus for duplicating phonograph records, a hollow cylindrical matrix or mold, closures for the ends of the mold, one of said closures being removable, a hollow inflatable expander within said

mold, and means communicating through one of said closures whereby the expander may be inflated or exhausted, and means communicating through the other closure whereby the air may be exhausted from between the expander and the mold, substantially as set forth.

11. In an apparatus for duplicating phonograph records, the combination of a hollow matrix or mold, a hollow flexible expander therein, hollow connecting means communicating with the interior of said expander, a second hollow connecting means communicating with the space between the expander and the interior of the matrix or mold, an exhaust pipe, and a three-way valve between the first named connecting means, the second named connecting means and the exhaust pipe, substantially as set forth.

12. In an apparatus for duplicating phonograph records, the combination of a hollow matrix or mold, a hollow flexible expander therein, a hollow connecting means communicating with the interior of said expander, a second hollow connecting means communicating with the space between the expander and the interior of the matrix or mold, an exhaust pipe, a three-way valve between the first connecting means, the second connecting means, and the exhaust pipe, and means whereby compressed air or air under atmospheric pressure may be admitted to the first named connecting means, substantially as set forth.

13. In an apparatus for duplicating phonograph records, the combination of a hollow matrix or mold, a hollow flexible expander therein, a hollow connecting means communicating with the interior of said expander, a second hollow connecting means communicating with the space between the expander and the interior of the matrix or mold, an exhaust pipe, a three-way valve between the first connecting means, the second connecting means and the exhaust pipe, and means for opening said second named connecting means to permit the ingress of air under atmospheric pressure, substantially as set forth.

14. In an apparatus for duplicating phonograph records, the combination of a hollow matrix or mold, a base whereon the same is supported, an arm connected with said base overhanging the matrix or mold, a closure for the top of the mold, means interposed between said closure and arm for securing the closure in place, a closure for the opposite end of the mold, and an expander within said mold, substantially as set forth.

15. In a device for duplicating phonograph records, the combination of abutments spaced apart, a hollow mold, a closure for one end of the mold, and expandible



means for holding the closure in place, all interposed between said abutments, an expander within said mold and a removable closure for the remaining end of the mold, substantially as set forth.

16. In a device for duplicating phonograph records, the combination of an apertured base, a hollow matrix or mold of lesser interior diameter and greater exterior diameter than said aperture in the base, and a closure passing through the aperture in the base for closing said mold, substantially as set forth.

17. In a device for duplicating phonograph records, the combination of an apertured base, an open-ended mold having its bore of a diameter less than that of the aperture in the base seated upon said base, a portion of its bottom being exposed through said aperture, means for holding said mold down upon said base, and a closure for the lower end of the mold and movable up and down through the aperture in the base, substantially as set forth.

18. In an apparatus for duplicating

phonograph records, the combination of a hollow matrix and an expander of substantially uniform diameter and having its normal diameter less than that of the matrix and suspended centrally within said matrix and entirely contained therein, substantially as set forth.

19. In an apparatus for duplicating phonograph records, the combination of a hollow matrix, an expander therein, and means for closing both the ends of the matrix, substantially as set forth.

20. In an apparatus for duplicating phonograph records, the combination of a hollow matrix or mold, a closure for one end thereof, an expander in said matrix and sustained by said closure, and a removable closure for the opposite end of the matrix or mold, substantially as set forth.

This specification signed and witnessed this 9th day of Sept. 1907.

JONAS W. AYLSWORTH.

Witnesses:

FRANK L. DYER,

FRANK D. LEWIS.

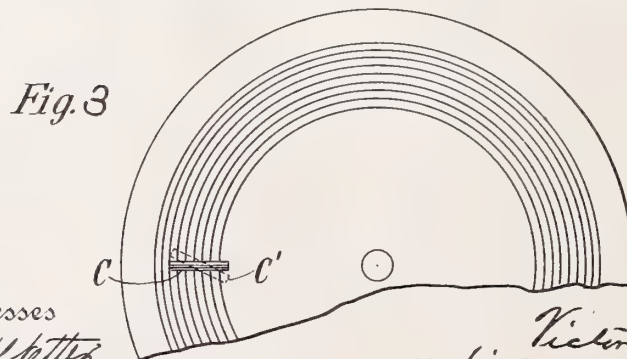
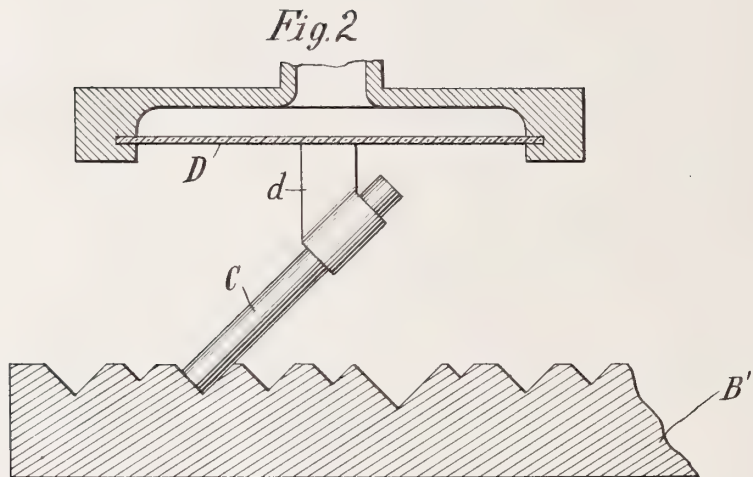
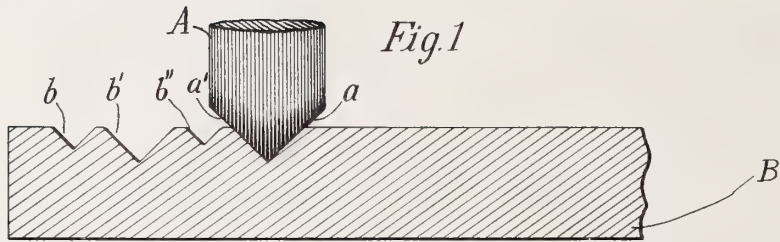
Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."



V. H. EMERSON.  
 REPRODUCER FOR GRAPHOPHONES.  
 APPLICATION FILED APR. 15, 1905.

1,026,084.

Patented May 14, 1912.



Witnesses  
*Russell Kettig*  
*Isidore R. Thompson.*

Inventor  
*Victor H. Emerson*  
 By his Attorneys  
*Maxwell Cameron Lewis Massey*

# UNITED STATES PATENT OFFICE.

VICTOR H. EMERSON, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN GRAPHOPHONE COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF WEST VIRGINIA.

## REPRODUCER FOR GRAPHOPHONES.

1,026,084.

Specification of Letters Patent.

Patented May 14, 1912.

Application filed April 15, 1905. Serial No. 255,802.

*To all whom it may concern:*

Be it known that I, VICTOR H. EMERSON, a citizen of the United States, and a resident of New York city, New York, have invented a new and useful Reproducer for Graphophones, which reproducer is fully set forth in the following specification.

This invention relates to talking-machines employing disk records which have vertically undulating record-grooves.

In machines employing ordinary disk records, the record-groove is relied upon to feed the sound-box across the disk, the spiral groove acting as a feed-screw. Heretofore, vertically undulating sound-grooves have generally been confined to cylindrical tablets; and when applied to disk tablets they fail to feed the sound-box properly, because of their shallowness,—the stylus being liable to leave the track, skipping one or more grooves and giving imperfect reproductions.

One object of the present invention is to provide a talking-machine in which vertically undulating disk records may be employed that will properly feed the sound-box. Again, disk records have heretofore required a fresh stylus (or "needle") for each reproduction, whereas cylinder records (with their vertically undulating grooves) employ the same stylus over and over again. By applying the vertically undulating record to a disk tablet, and by giving the groove the proper configuration, I am enabled to accomplish the combined results of both feeding the sound-box across the disk and of using the same needle for all reproductions. In the third place, if the ordinary reproducing stylus employed in cylinder machines be used with a vertically undulating groove deep enough to feed it, the stylus will not enter the more minute irregularities, and the reproduction will be correspondingly defective.

Another object of my invention, then, is to provide, in connection with a record-groove capable of feeding the sound box, a stylus that will give faithful reproductions from such record-groove.

The invention will be best understood by referring to the accompanying drawings which illustrate the same.

Figure 1 is a cross-section, greatly enlarged, representing a recording-tablet and the recording-stylus used in the present in-

vention; Fig. 2 is a similar view of the record-tablet employed in the present invention, showing my reproducer in connection therewith; and Fig. 3 is a plan view of a disk tablet, partly broken away, showing the position of the reproducing-stylus in connection therewith.

In making the record an angular or V-shaped recorder A is employed, which is connected with the diaphragm of a suitable sound-box in such a manner as to vibrate vertically in operative relation to a recording tablet B which is caused to rotate beneath the stylus A in the well known manner so as to receive a spiral groove. At *a, a'* are represented the two sharp edges of the recorder A. These are shown as straight edges that converge at a right angle, each lying at an angle of 45° to the surface of the tablet B; but this angle may be more acute, or more obtuse, and instead of converging to a point, there may be more or less curvature or roundness. Obviously, the stronger the impulse imparted to the diaphragm that actuates stylus A, the deeper will be the cut made into the record by the recorder, but the cross section of the cut at any place will always be the same as the profile of the recorder A. At *b, b', b''*, are illustrated cuts or grooves of different depths.

The disk record B', in Fig. 3, may be obtained from the original record B (Fig. 1) by the well-known "Jones process" set forth in Patent No. 688,739, granted Dec. 10, 1901, to Joseph W. Jones *et al.* My new reproducing-stylus C is shown as presented at an angle of 45° to the surface of tablet B', being secured in any convenient manner to the diaphragm-post *d* projecting from the center of the diaphragm D of the sound-box. This sound-box is arranged with its diaphragm substantially horizontal, and is carried on a swinging arm the same as in any of the well-known constructions employed in disk talking-machines. This stylus C is preferably a small cylinder of sapphire, whose lower end is cut off square, practically the same article that is used as the recording-stylus for cylindrical records.

If the cross-section of the sound-groove shows two straight sides converging at a right angle, then the flat base of the cylinder C will rest against one side, and one "element" of the cylinder will rest against the other side of the cut; and, no matter



how deep or how shallow any portion of the cut may be, since the sides of the cut are always at (substantially) the same angle, the stylus will always enter the cut to the full depth of the latter, consequently, a faithful reproduction will always be obtained. Furthermore, since these cuts are not the shallow, rounded affairs heretofore constituting record-grooves of this type, the stylus C will be fed without any danger of "skipping."

If the cross-section of the record-grooves does not show an exact right angle, the lower end of the stylus C may be more or less varied accordingly, as may be obvious, but the same benefits will be obtained in a greater or less degree.

Fig. 3 shows the stylus C as lying in the vertical plane through a radius of the disk B', while Fig. 2 shows that the stylus is at an angle of  $45^\circ$  to the surface of the disk; but instead of lying in a radial plane, the stylus may be in some other plane as indicated by the dotted lines C', and it may also be at an angle somewhat greater or less than exactly  $45^\circ$ . But in any variation, the stylus will still be "diagonal" to the record-groove.

Having thus described my invention fully, I claim:

1. The combination of a tablet having a spiral sound-groove the walls of which groove converge at an angle, and a stylus

presented transversely of said groove and at less than a right angle to said tablet, the end of the stylus engaging one wall of the groove and the side of the stylus engaging the other wall of the groove. 35

2. The combination of a disk tablet having a spiral sound-groove characterized by vertical irregularities, a diaphragm, and a stylus entirely supported by said diaphragm and lying in the vertical plane through a radius of said disk, said stylus being presented at an angle of approximately  $45^\circ$  to the surface of the disk. 40 45

3. In a talking machine, the combination of a tablet containing a vertically undulating sound-groove whose walls converge at an angle of approximately  $90^\circ$ , and a reproducing stylus whose end face engages one wall of the groove and whose side engages the other wall of the groove. 50

4. The combination of a disk tablet having a spiral sound-groove characterized by vertical irregularities, a diaphragm, and a stylus entirely supported by said diaphragm and lying in the vertical plane through a radius of said disk. 55

In testimony whereof I have signed this specification in the presence of two subscribing witnesses. 60

VICTOR H. EMERSON.

Witnesses:

G. A. MANWARING,

WM. HACKLAND.

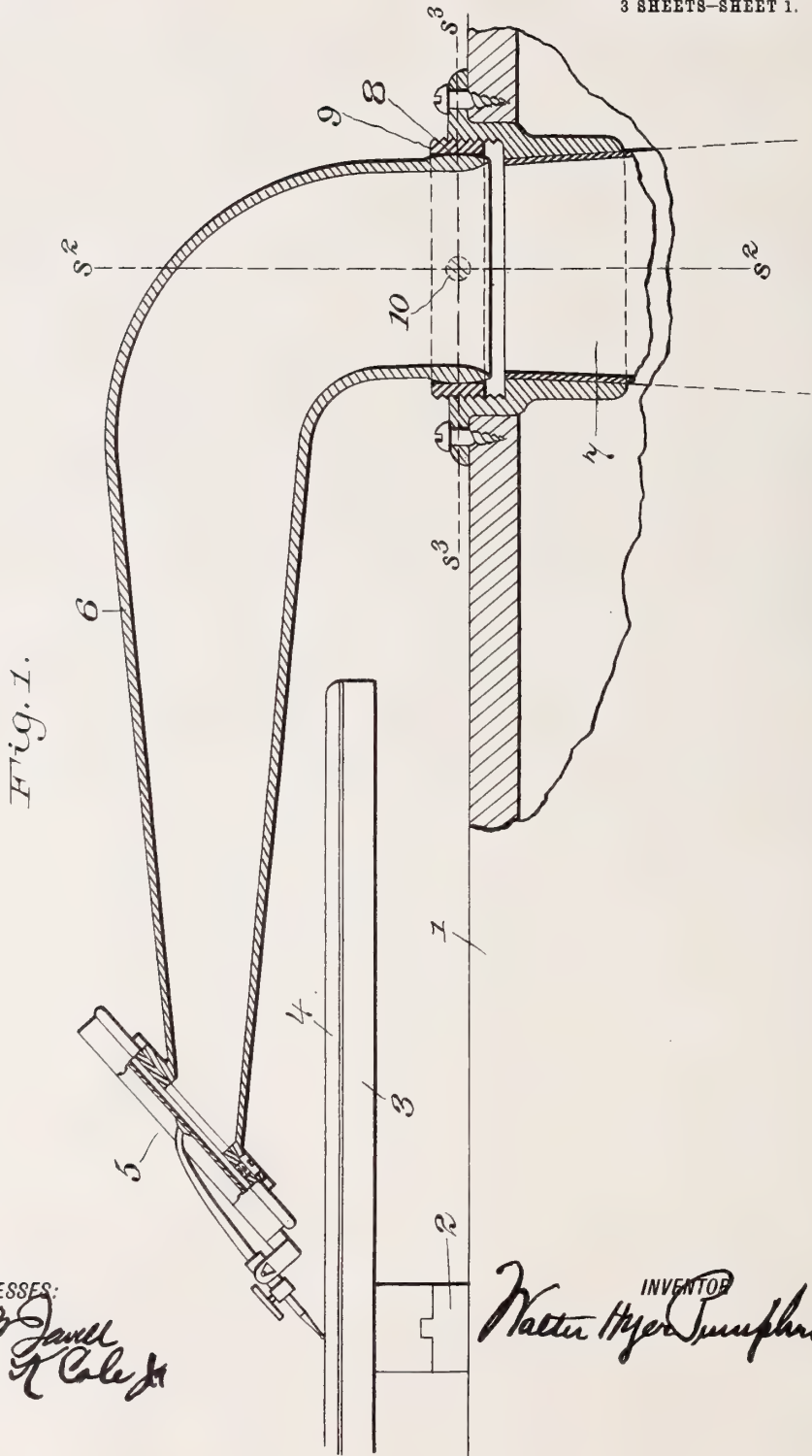


W. H. PUMPHREY.  
TALKING MACHINE.  
APPLICATION FILED JAN. 9, 1912.

1,026,178.

Patented May 14, 1912.

3 SHEETS—SHEET 1.



WITNESSES:  
*Robert W. James*  
*James H. Cole*

INVENTOR  
*Walter H. Pumphrey*





INVENTOR  
Keller Hays Humphrey



W. H. PUMPHREY.  
TALKING MACHINE.  
APPLICATION FILED JAN. 9, 1912.

1,026,178.

Patented May 14, 1912.

3 SHEETS—SHEET 3.

Fig. 4.

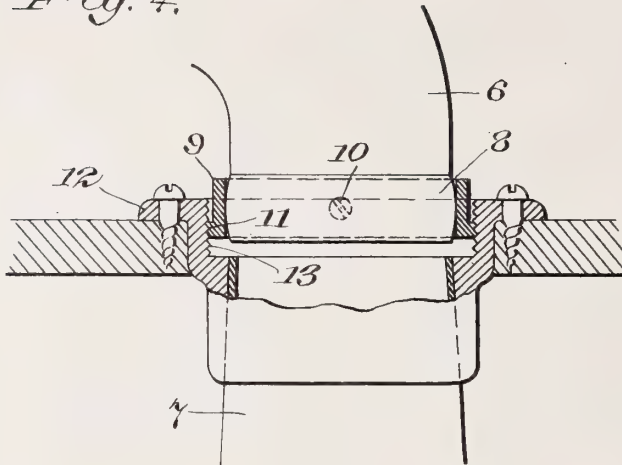
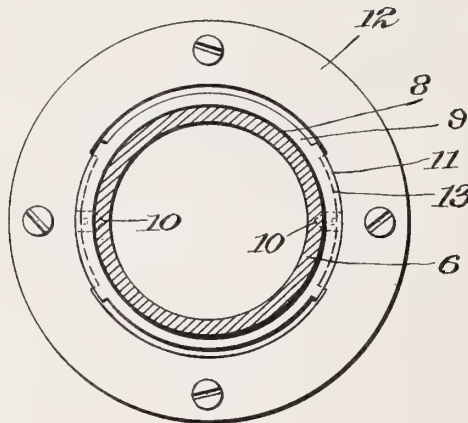


Fig. 5.



WITNESSES:

*Buttress M. Jewell*  
*James H. Cole Jr.*

INVENTOR

*Walter Hyde Pumphrey*

# UNITED STATES PATENT OFFICE.

WALTER HYER PUMPHREY, OF NEW YORK, N. Y., ASSIGNOR TO BOSTON TALKING MACHINE COMPANY, A CORPORATION OF MAINE.

## TALKING-MACHINE.

1,026,178.

Specification of Letters Patent.

Patented May 14, 1912.

Application filed January 9, 1912. Serial No. 670,257.

### *To all whom it may concern:*

Be it known that I, WALTER H. PUMPHREY, a citizen of the United States of America, residing at New York, in the  
5 county of New York and State of New York, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

My invention relates to talking machines  
10 and has particular reference to a mounting for the tone-arm thereof. In such machines, it is ordinarily essential that the tone-arm have free movement in vertical and horizontal planes and the purpose of  
15 the present invention is to produce an extremely simple and inexpensive form of mounting which will permit such movement of the tone-arm and reduce friction to a minimum.

20 It is a further object of the invention to provide for readily removing the tone-arm or placing the same in position, without requiring the aid of skilled workmen or tools, thus facilitating packing, shipping and assembling the machine for use.  
25

A further object is to avoid the necessity for careful and accurate adjustment of parts in mounting the arm and produce a construction in which confusion or mistake  
30 in assembling will be rendered improbable if not impossible and the parts will be self adjusting when brought into operative relation with each other.

These and other objects are attained by  
35 mechanism illustrated in the accompanying drawings, which will serve to carry my invention into effect. I wish it understood, however, that I do not limit myself to either the exact form or details shown, as various  
40 changes may be made within the meaning of the present invention.

In the drawings—Figure 1 is a view in elevation, partly in section, showing the invention applied to a talking machine of the  
45 concealed horn type. Fig. 2 is a section on the line S<sup>2</sup>—S<sup>2</sup> of Fig. 1. Fig. 3 is a similar view on the line S<sup>3</sup>—S<sup>3</sup> of Fig. 1, Fig. 4 is a vertical sectional view illustrating a modi-

fication. Fig. 5 is a horizontal sectional view of a further modification.

Referring now to the drawings, 1 represents a portion of the cabinet of a talking machine, 2 is the upwardly projecting end of the motor shaft on which a turntable 3 is mounted and serves as a support for the  
55 record disk 4. Coöperating with the record, there is a sound reproducer consisting of a sound box 5, a tone-arm 6, and a horn 7, relatively arranged in the usual manner. The tone-arm is mounted to have free movement in planes at right angles to each other.  
60 In a machine such as is here shown, the tone-arm swings and is limited to movement in vertical and horizontal planes. At the rear or larger end, the tone-arm is  
65 given the approximate form of a portion of a sphere, as indicated at 8 and loosely encircling the shaped end, there is a ring 9 which is secured thereon by two screws 10. The screws are arranged diametrically opposite each other, in a line intersecting the center of the spherical portion of the tone-arm and serve as a turning axis about which the arm has free movement in vertical  
70 planes. As shown, the screws are threaded in the ring 9 and provided with rounded or conical bearing points which enter correspondingly formed recesses in the shaped end of the tone-arm.  
75

It will be observed that in assembling the  
80 ring and arm, as above described, the straight surface of the ring is coöperatively presented to the spherical surface of the arm and by reason of the resulting tangential relation of the parts, contact is reduced  
85 to a mere theoretical line thus doing away with all friction. In order now to provide for free horizontal movement of the tone-arm, the ring 9 is exteriorly threaded, as indicated at 11 and screwed into the open  
90 end of a fixed tubular casting 12, which is counter-bored and tapped as at 13, to receive the threaded ring. The casting 12 is interposed as a connection between the tone-arm and horn and is secured by screws as  
95 shown, in an opening in the wall or parti-



tion of the cabinet. In cutting the thread 11 and 13, provision is made for allowing the ring 9 to turn readily in the casting 12 and as such turning movement of the ring is 5 imparted to it by the tone-arm, free swing of the latter in horizontal planes is thus insured.

As shown in the drawings, the ring 9 is screwed down into the casting 12, to about 10 two-thirds of the depth of the tapped bore but it will be understood, that engagement to this extent is not necessary and only tends to increase friction without adding practically to the efficiency of the connection. One 15 or two turns of the ring in the casting will serve ordinarily to unite the members in operative relation and avoid unnecessary friction. Again, to positively limit the engagement of the threaded members, the 20 ring may be reduced in diameter exteriorly as shown in Fig. 4, leaving only space enough to form two or three turns of the thread. I may also cut out portions of the 25 thread from both the ring and the casting as in Fig. 5, and form a joint resembling in some respects the type known as a bayonet joint.

I am aware that universal joints of various forms have been employed in talking 30 machines to give the sound-box movement in vertical and horizontal planes, also that tone-arms have been mounted on oppositely disposed studs, screws and balls to have such movement about the same but in all such 35 constructions, the removal of the tone-arm or the placing of the same in position cannot be readily accomplished and usually requires the aid of skilled workmen, and in many instances, special tools, to say nothing 40 of the frequent loss of parts and the difficulty and annoying delay in duplicating them. In the present construction, rotation of the tone-arm is all that is necessary to either entirely remove the arm or place 45 it in operative position ready for immediate use, such rotation serving to cause the engagement or disengagement of the ring 9 and casting 12. When disengaged, it will be observed that the ring 9 remains in position on the shaped end of the tone-arm, being 50 secured by the screws 10 so that there are no detached parts to lose or to confuse and mystify the layman and in assembling the machine or placing the tone-arm in position, it is only necessary to screw one 55 threaded member *i. e.*, the ring 9, carried by the arm, into another *i. e.* the casting 12.

In providing a mounting at the inner end of the arm, capable of giving two motions, I 60 am enabled to construct the arm and horn of gradually tapering length, which theoretically at least, tends to improve the reproduction of sound and from a commercial point

of view adds greatly to the appearance of the machine. 65

As a further advantage in employing a screw-ring 12 I would mention its low cost of manufacture, it being simply a short piece of a threaded tube, which latter on being cut into suitable lengths produces these 70 rings in any number desired and when drilled and tapped to receive the cone-screws, are complete and ready for use.

The operation of the machine as well as various advantages not herein mentioned 75 will be apparent from the foregoing description.

Having, therefore, described my invention, I claim:

1. In a talking machine, a tone-arm, a 80 helical bearing on which the arm has free movement in substantially horizontal planes and a pivotal bearing within the helix on which the arm swings freely in vertical 85 planes.

2. In a talking machine, a fixed member shaped to provide a helical bearing, and a tone-arm pivotally mounted within the helical bearing and being freely movable on 90 said bearings.

3. In a talking machine, a mounting for a tone-arm comprising helical and pivotal bearings arranged one within the other, and a tone-arm having free movement on the bearings in planes substantially at right 95 angles to each other.

4. In a talking machine, a mounting for a tone-arm comprising helical and pivotal bearings arranged one within the other in substantially the same plane. 100

5. In a talking machine, a mounting for a tone-arm comprising a helical bearing, a pivotal bearing, and means supporting the pivotal bearing within the helical bearing.

6. In a talking machine, a mounting for a 105 tone-arm comprising a helical bearing, a pivotal bearing within the helical bearing, and supporting means for the pivotal bearing movable on the helical bearing.

7. In a talking machine, a mounting for 110 a tone-arm comprising a member shaped to provide a helical bearing, a tone-arm centered relatively to the helical bearing, and an annular member movable on the bearing and having the tone-arm pivoted therein. 115

8. In a talking machine, a mounting for a tone-arm comprising a member shaped to provide a helical bearing, a tone-arm pivoted in centered relation in the helical bearing, and an interposed support for the tone- 120 arm movable on the bearing.

9. In a talking machine, a mounting for a tone-arm comprising a helical bearing, an annular member located in the plane of and movable on the bearing and provided at 125 diametrically opposite points with shaped

projections, and a tone-arm movably supported on the projections.

10. In a talking machine, a mounting for a tone-arm comprising a fixed threaded member, a ring engaging the threaded member and a tone-arm pivotally mounted in the ring.

11. In a talking machine, a mounting for a tone-arm comprising a fixed member

threaded internally, a ring screwed into the member and a tone-arm pivotally mounted in the ring with its exterior surface disposed in tangential relation to the surface of the ring. 10

WALTER HYER PUMPHREY.

Witnesses:

CUTHBERT W. JEWELL,

JAMES K. COLE, Jr.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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H. MIKOREY.  
TALKING MACHINE.

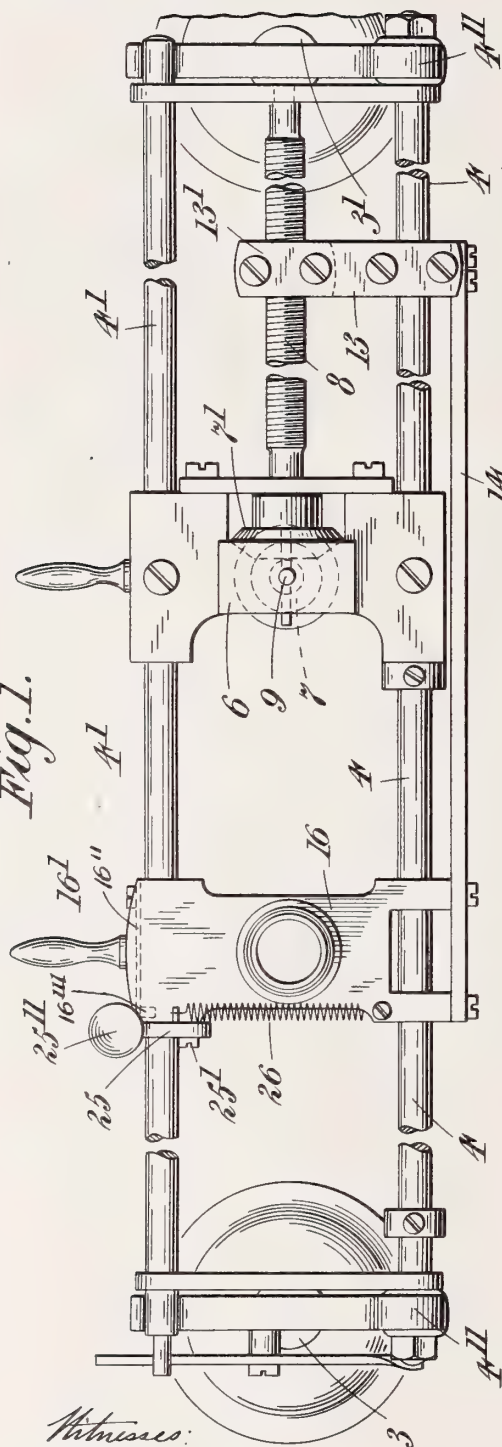
APPLICATION FILED JAN. 16, 1912.

1,027,350.

Patented May 21, 1912.

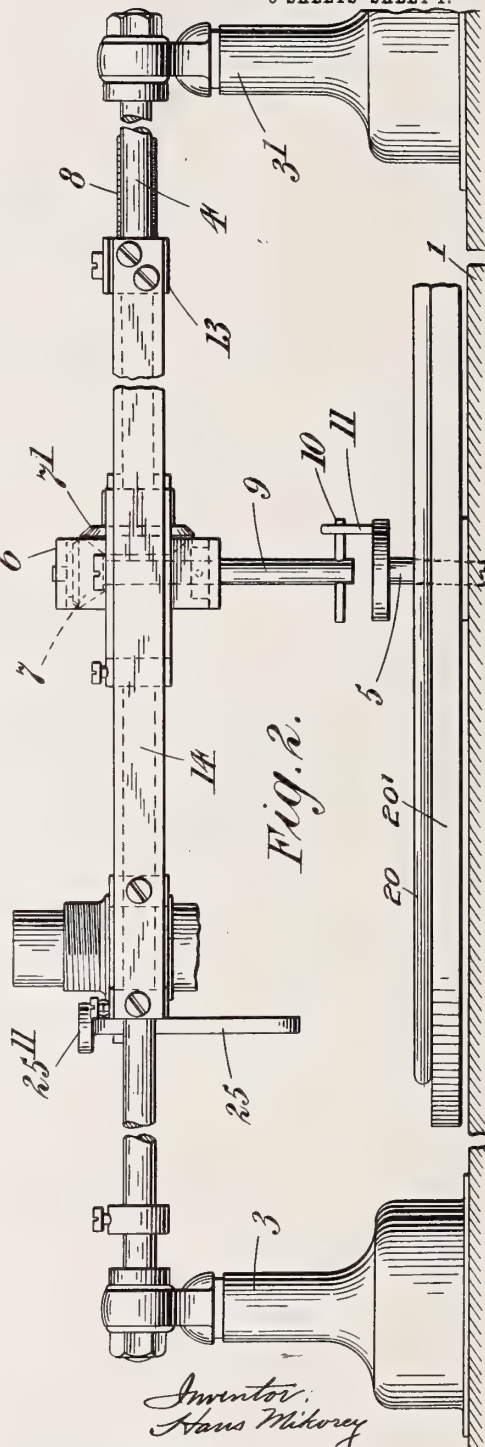
3 SHEETS-SHEET 1.

Fig. 1.



Witnesses:  
L. J. Hoskinson,  
C. D. Brown.

Fig. 2.



Inventor:  
Hans Mikorey  
by Foster Truman Watson & Co. Attys

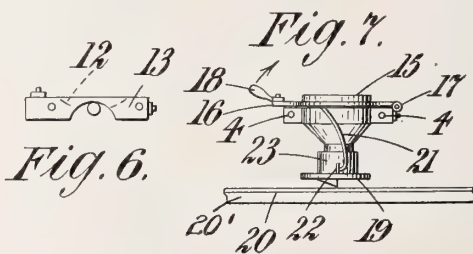
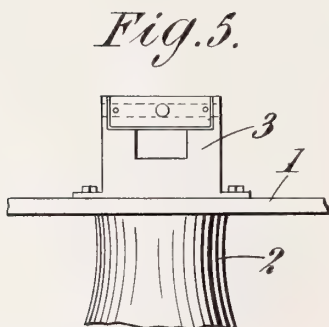
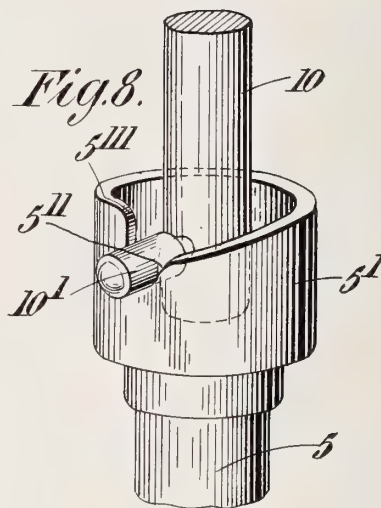
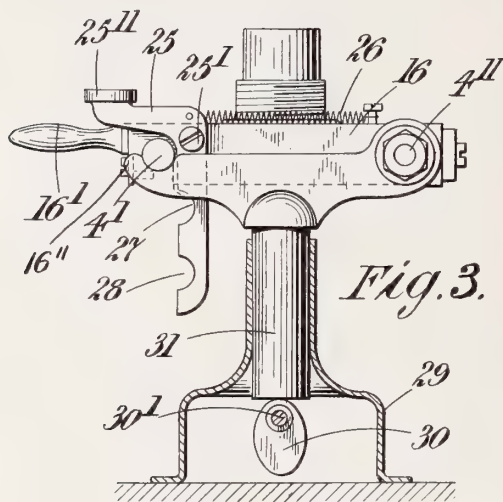
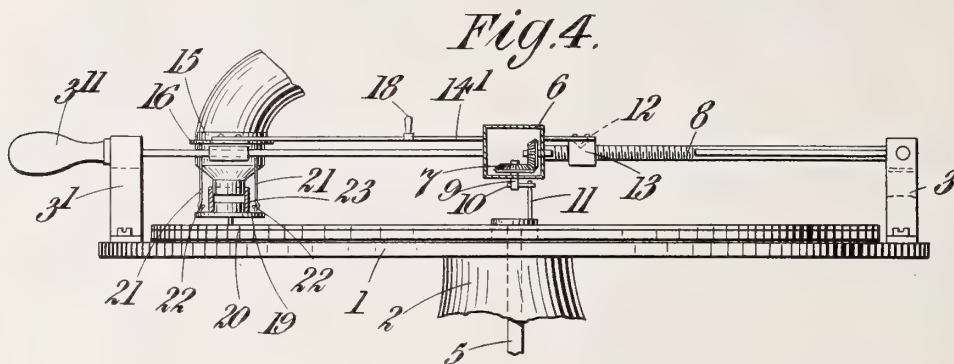


1,027,350.

H. MIKOREY.  
TALKING MACHINE.  
APPLICATION FILED JAN. 16, 1912.

Patented May 21, 1912.

3 SHEETS—SHEET 2.



Witnesses:  
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attys





H. MIKOREY.

TALKING MACHINE.

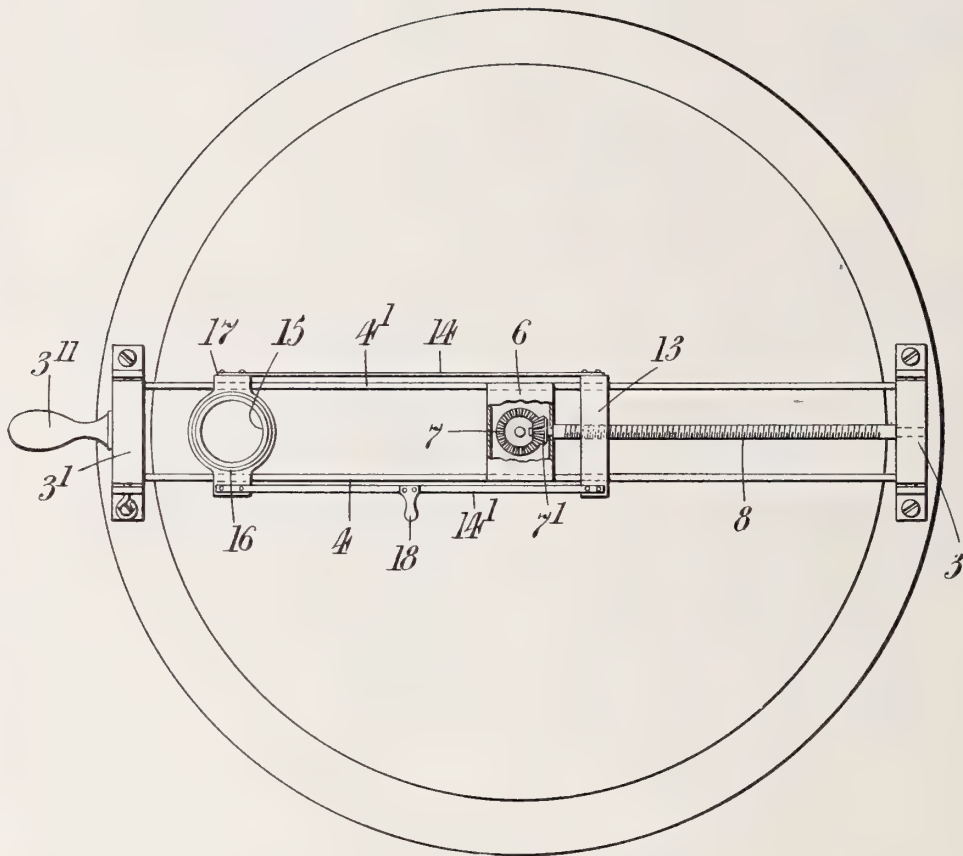
APPLICATION FILED JAN. 16, 1912.

1,027,350.

Patented May 21, 1912.

3 SHEETS-SHEET 3.

*Fig. 4.<sup>a</sup>*



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# UNITED STATES PATENT OFFICE.

HANS MIKOREY, OF BERLIN, GERMANY, ASSIGNOR TO LETTROPHONES LIMITED, OF LONDON, ENGLAND.

## TALKING-MACHINE.

1,027,350.

Specification of Letters Patent.

Patented May 21, 1912.

Application filed January 16, 1912. Serial No. 671,433.

*To all whom it may concern:*

Be it known that I, HANS MIKOREY, a subject of the Emperor of Germany, residing at Berlin, Germany, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

This invention relates to talking machines and more especially to a guide for the sound-box holders thereof.

The machine is adapted for use as a recorder as well as a reproducer. The guide can be fitted to any machine as well as to apparatus especially constructed.

The novel features of the machine according to this invention consist broadly in the employment of a guide-bridge spanning the record tablet and capable of being thrown back about an axis parallel with its length, while it can also be lifted bodily together with a diaphragm-holder, a direct driving mechanism and a screw gear for traversing the diaphragm-holder for which it acts as a guide in its movement over the record; and in a construction and arrangement of the parts such that when the bridge is lifted the traversing gear is immediately declutched from the driving motor, while conversely the bridge when lowered at any position of the traversing gear as promptly puts the latter into operation again by clutching with the said driving motor without the need of careful centering. It is preferred in such a mechanism that the bridge should have the diaphragm-traversing-guide in one half, and the screw or other traversing gear in the other half with a dividing box, wherein a direct gear drive, screw, or the like is contained. In addition to the two movements which may be given to the bridge, the diaphragm-holder may itself be swung back about a pivot formed by one of the guide-bars of the bridge, and when so moved, takes the traversing nut out of engagement with the traversing screw.

A further feature is a device on the guide by means of which the sound-box is lifted from the record disk whenever the spindle is made to run idly.

Constructions according to this invention are illustrated in the accompanying drawings, wherein—

Figure 1 is a plan showing only the bridge and its pertinent gear and omitting the base

table and record tablet of the machine; Fig. 2 is a side elevation with parts of the machine broken away; Fig. 3 is an end view of Fig. 2 showing one mode of mounting the bridge; Fig. 4 illustrates a somewhat different construction, and particularly an alternative mode of mounting the bridge; Fig. 4<sup>a</sup> shows a plan of Fig. 4; Figs. 5, 6 and 7 are detail views relating to the device of Fig. 4, and Fig. 8 is a perspective view of a detail usable on either form of machine as illustrated.

Like letters of reference refer to like parts throughout these drawings.

To the base-plate 1 of the machine, which is secured upon the casing 2, brackets 3, 3<sup>1</sup> are mounted and bear the bridge formed by two guide rods 4, 4<sup>1</sup>. This bridge is so arranged as to span the record tablet 20, borne by the table 20<sup>1</sup> which receives motion from any suitable clock-work mechanism contained within the base 1, and having a driving spindle 5 shown partly dotted in Fig. 2. Not only may the bridge be swung about a pivot out of the way, but it can also be raised bodily, carrying with it all the driving mechanism clear away from the record. Fig. 3 and the corresponding figures show such a construction, but in the alternative of Fig. 4 the bridge is shown pivoted in one of the end standards 3 and as provided with a handle 3<sup>11</sup> for swinging it in a vertical plane about the said pivot. The bridge is divided at about its center by an open casing 6 placed immediately over the driving spindle 5 of the machine and containing bevel gears 7, 7<sup>1</sup> journaled in the sides of the casing. The casing 6 is secured to the guide rods 4, 4<sup>1</sup>. The horizontal gear 7 is secured to a short spindle 9 from which projects at right angles a pin 10 to engage a driver pin 11 which projects from the head of the spindle 5 for the purpose of transmitting the drive. Fig. 8 shows a modified form of the pin drive in which the spindle 5 has a head 5<sup>1</sup>, the upper face of which is notched at 5<sup>11</sup> and has suitably curved edges 5<sup>111</sup> in the neighborhood of the notch. The pin 10 bears a roller 10<sup>1</sup> which can freely revolve upon it. The vertical part of the bevel gear 7<sup>1</sup> is secured to a screw-threaded spindle 8 mounted in one half of the bridge between the guide rods 4, 4<sup>1</sup> and journaled in the casing 6 and in the bracket 3<sup>1</sup>. It will be seen that when the spindle 5 rotates, the driver

pin 11 will transmit the driving effort to the spindle 8.

The arrangement of driving head illustrated in Fig. 2 is not always desirable for the reason that, when the bridge has been raised to take the recording or reproducing stylus off the record tablet and declutch the driving motor and traversing gear, it may occur that—the record being assumed to be rotating—on lowering the bridge the driver 11 may take up the drive on one side of the driver-pin 10 or on the other, that is to say, it may revolve through nearly 180° before traversing commences, and the result is that through starting to traverse at a point different from that at which traversing ended when the bridge was lifted, either part of the recorded sounds are erased or missed as the case may be, or an objectionable hiatus is left in the record. Similarly, in the device of Fig. 4 the position of the driver-pin 10 may be such that when the bridge is lowered the stylus will descend on to the record at once without hindrance and without promptly actuating the traverse.

By employing the device of Fig. 8 the bridge when lowered in the wrong position is prevented from descending so far as to bring the stylus into contact with the record tablet by the fact that the driver-pin 10<sup>1</sup> must be adjacent to the shoulder 5<sup>111</sup>, and cannot be so in any but the correct position because it will contact with a part of the top surface of this driving head. The latter surface is so formed as to gradually lower the driver-pin until it rests in the notch 5<sup>11</sup> at the base of the shoulder 5<sup>111</sup>. The precise configuration shown for the head 5<sup>1</sup> need not be adhered to, so long as the desired conditions are secured.

On one of the guide rods 4 a cross head 13 slides and is provided with a nut 13<sup>1</sup> which engages with the screw 8 and being connected by a bar 14 to the sound-box holder 16 causes the latter to slide over the guide bars 4, 4<sup>1</sup> when the screw is rotated with the nut 13<sup>1</sup> in engagement. The sound-box holder 16 and the cross-head 13 can not only slide along the guide 4, but can also be swung about the same as a pivot. Further, as seen in Fig. 3, the whole bridge can also be swung about pivots 4<sup>11</sup> so as to lift the sound-box holder, the driving gear, the screw and the rest of the parts carried upon the bridge clear of the record disk.

Means are provided whereby when the sound box holder is moved from the record disk support independent of any adjustment of the bridge or guide for such holder it may be retained in its elevated position. Such means are particularly illustrated in Fig. 3 and comprise a bell crank latch 25 pivotally supported on the sound box holder at 25<sup>1</sup> and provided with two notches 27, 28 in its dependent arm which notches are adapted to

engage the rod 4<sup>1</sup> of the bridge or guide for the sound box holder when said holder is rocked about the other guide rod 4<sup>11</sup>. The other arm of said bell crank latch is provided with a key or head 25<sup>11</sup> by means of which it may be rocked to disengage either of the notches 27, 28 from the rod 4<sup>1</sup>, a spring 26 acting to engage the latch with said rod 4<sup>1</sup>. The key 25<sup>11</sup> is located adjacent the handle 16<sup>1</sup> by which the sound box holder is rocked so that it may be readily manipulated while the holder is being shifted.

The method of raising the whole guide together with the various parts borne by it is illustrated more particularly in Fig. 3. Each of the end standards 29 contains cams 30 pivoted at 30<sup>1</sup>, while short pillars 31 bear upon the cams and slide within the standards which are made hollow. The cam 30 is rotated by means of a suitable connection so as to act upon the under side of the pillars 31 and force them upward, thus raising the guide by the operation of the eccentric portion of the cams. The arrangement is precisely the same in each standard, so that a lift parallel with the record disk is given to the bridge. Normally the parts are in the relation shown in Fig. 3, and in this position the reproducing or recording stylus would be in operation, while to bring about a cessation of its action, the cams 30 are turned, as explained, by any suitable means. A spring lock comprising a spring blade 16<sup>11</sup> secured to the part 16 and a pin 16<sup>111</sup> projecting from the blade under the guide-bar 4<sup>1</sup> is provided to act as a check whereby accidental pivotal movement of the diaphragm-holder 16 is prevented. It should be noted that such pivotal movement also brings about the disengagement of the nut 13 from the traversing screw 8.

In Figs. 4 and 4<sup>a</sup>, the cross head 13 is connected by means of two guide bars 14, 14<sup>1</sup> to the sound-box holder 15 which slides upon the rods 4, 4<sup>1</sup> in one half of the bridge. One of the bars 14 extends directly from the cross head 13 to the holder 15 and is secured thereto. The boss or eye for receiving the sound-box holder is hinged at 17. The object of this arrangement is to lift off the soundbox 19 from the record disk 20 in order to avoid injury to the latter whenever the guide is raised by means of a handle 18 provided for the purpose. In either modification, whenever the sound-box holder is lifted the cross head 13 is lifted from the spindle 8 so that no motion is transmitted. The diaphragms are preferably so held that their action is normal to the disk.

In Fig. 7, the eye 16 has two hooks 21 secured to it which engage with eyes 22 of the sound-box and lift the latter from the record disk. The sound-box is introduced into a sleeve 23 adjustably mounted on the holder



15. This method of securing the sound-box does not, however, form part of the present invention.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In a machine of the character described, the combination with a rotatable support for a record disk, and driving devices for rotating said support, of a guide for a sound box extending over the disk support and adapted to be bodily rocked about a horizontal axis, a sound box movable longitudinally of the guide and adapted to be adjusted to and from the disk support independently of any adjustment of the guide, means for adjusting the sound box and guide vertically in parallelism with the disk support, and means for connecting the sound box with the driving devices of the disk support to move the box longitudinally of its guide.

2. In a machine of the character described, the combination with a rotatable support for a record disk, and driving devices for rotating said support, of a guide for a sound box extending over the disk support and adapted to be bodily adjusted vertically in parallelism with the disk support and to be rocked about an axis parallel with its length, a sound box supported by the guide, and means for connecting the sound box with the driving devices of the disk support to move the box longitudinally of its guide.

3. In a machine of the character described, the combination with a rotatable support for a record disk, and driving devices for rotating said support, of a pair of relatively stationary standards, a guide for a sound box extending over the disk support and engaged with the standards by means permitting it to be adjusted bodily vertically, said guide being further adjustable about a longitudinal, horizontal axis, a sound box engaging the guide and adapted to be adjusted to and from the disk support independently of any movement of the guide, and means for connecting the sound box with the driving devices of the disk support to move the box longitudinally of the guide.

4. In a machine of the character described, the combination with a rotatable support for a record disk, and driving devices for

rotating said support, of a pair of relatively stationary standards, a guide for a sound box extending over the disk support and having depending members telescopically connected with the standards, means for adjusting the guide bodily vertically, said guide being further adjustable about a longitudinal, horizontal axis, a sound box engaging the guide and adapted to be adjusted to and from the disk support independently of any movement of the guide, and means for connecting the sound box with the driving devices of the disk support to move the box longitudinally of the guide.

5. In a machine of the character described, the combination of a rotatable support for a record disk, a vertical driving shaft for the disk support having at its upper end a tubular head provided with a peripheral notch, a guide for a sound box extending over the disk support and adapted to be rocked about a horizontal axis, a feed screw carried by said guide, gearing for rotating the screw including a depending shaft having a radial projection adapted to enter the notch in the head on said vertical shaft, a sound box on the guide, and a nut connected with the sound box and engaging the feed screw.

6. In a machine of the character described, the combination of a rotatable support for a record disk, a vertical driving shaft for the disk support having at its upper end a tubular head provided with a peripheral notch, a guide for a sound box extending over the disk support and adapted to be rocked about a horizontal axis, a feed screw carried by said guide, gearing for rotating the screw including a depending shaft having a radial projection adapted to enter the notch in the head on said vertical shaft, and a sound box supported by the guide and having means engaging the feed screw, said box being movable to and from the disk support independently of any adjustment of the guide.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

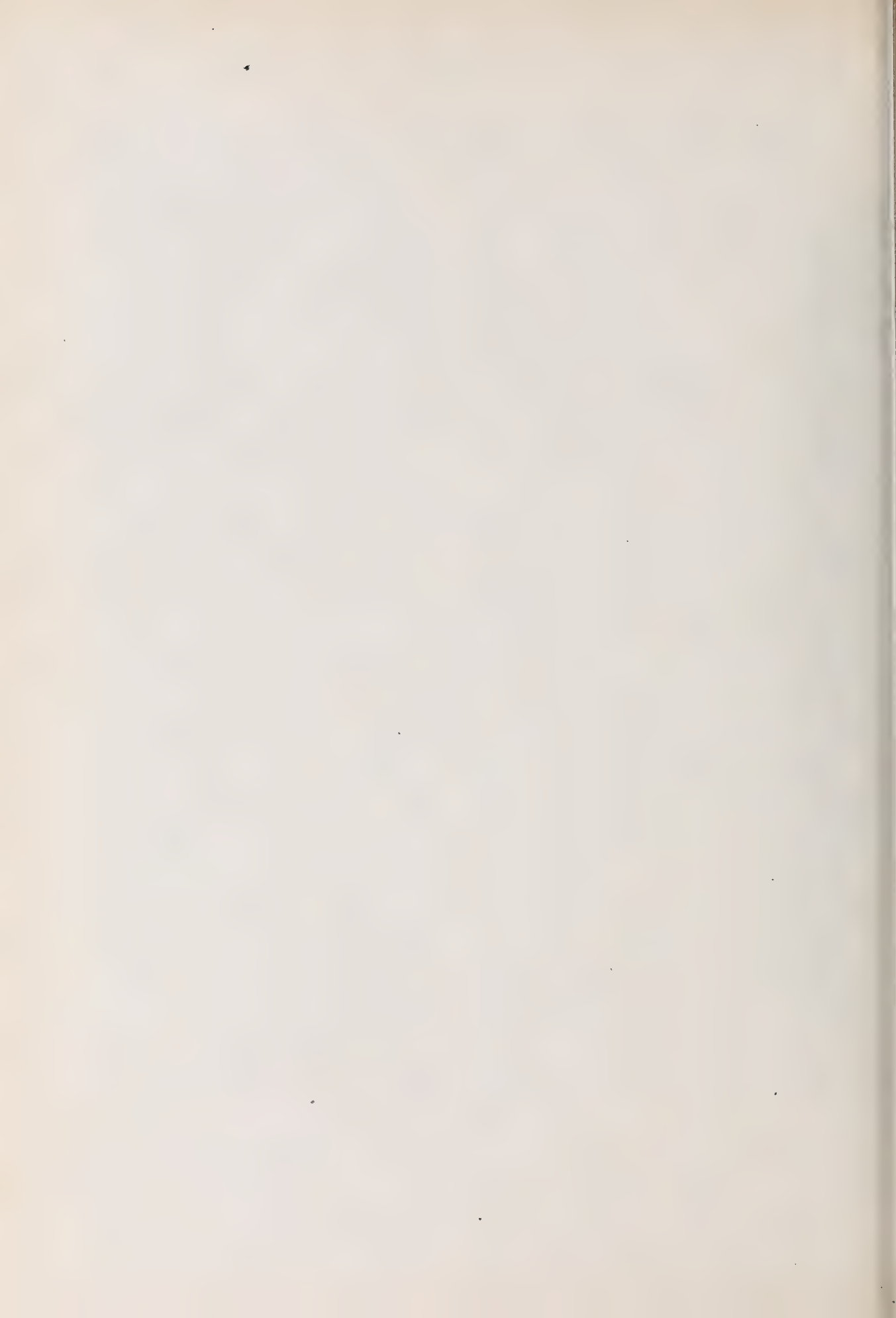
HANS MIKOREY.

Witnesses:

HENRY HASTER.

LOUIS G. DREYFUS, Jr.





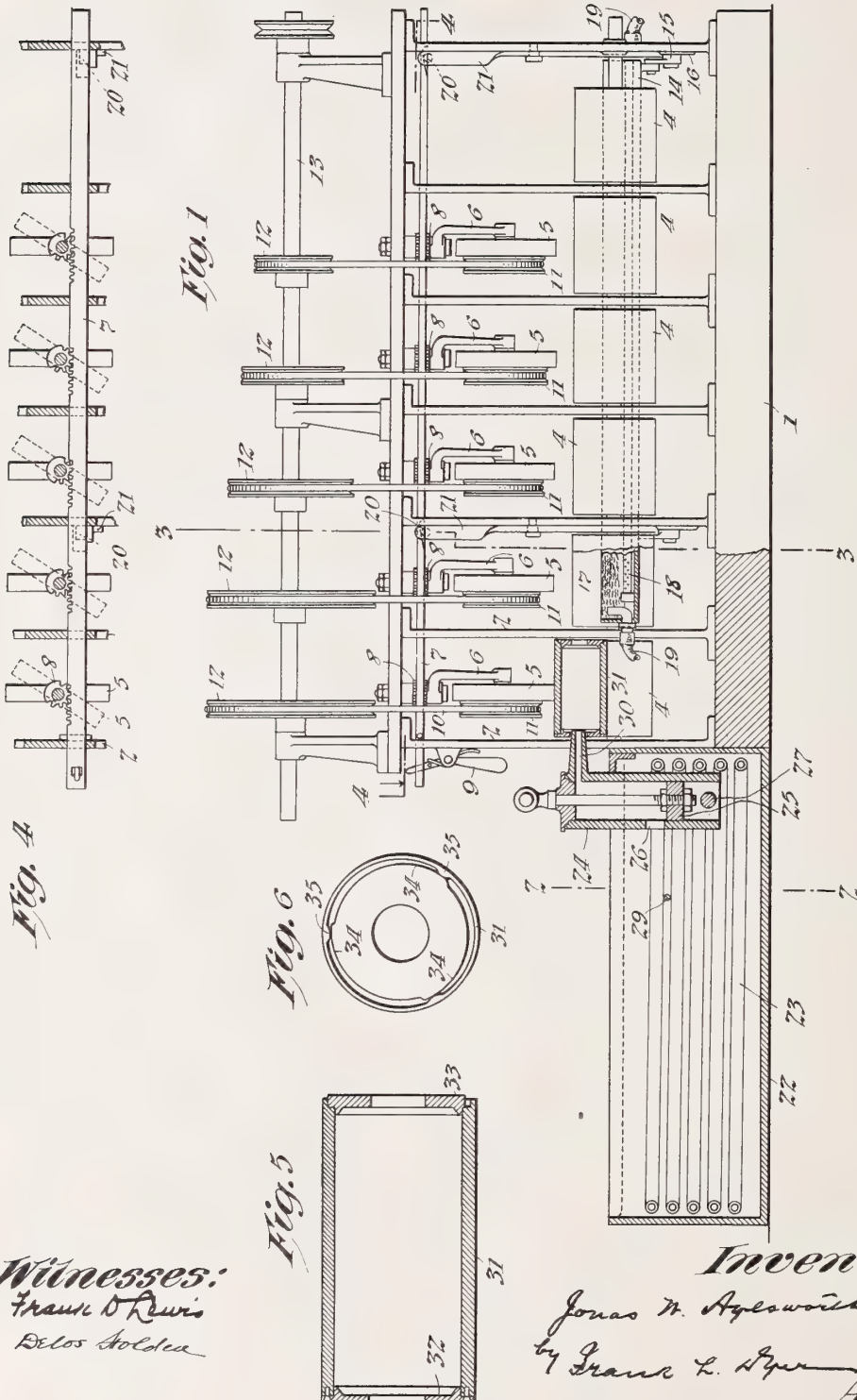


J. W. AYLSWORTH.  
 APPARATUS FOR MAKING DUPLICATE PHONOGRAPH RECORDS.  
 APPLICATION FILED MAR. 12, 1907.

1,027,793.

Patented May 28, 1912.

2 SHEETS—SHEET 1.



Witnesses:  
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Inventor:  
 Jonas W. Aylsworth  
 by Frank L. Spence  
 Atty.





J. W. AYLSWORTH.  
 APPARATUS FOR MAKING DUPLICATE PHONOGRAPH RECORDS.  
 APPLICATION FILED MAR. 12, 1907.

1,027,793.

Patented May 28, 1912.

2 SHEETS—SHEET 2.

Fig. 3

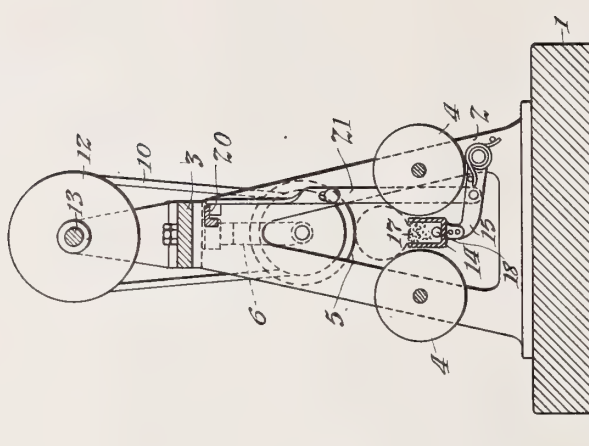
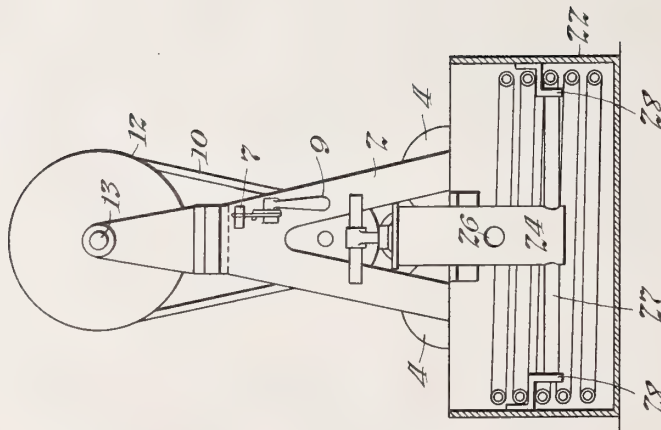


Fig. 2



Witnesses:

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 Elias Holden

Inventor:

James W. Aylsworth  
 by Frank L. Hyman *Atty.*

# UNITED STATES PATENT OFFICE.

JONAS W. AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## APPARATUS FOR MAKING DUPLICATE PHONOGRAPH-RECORDS.

1,027,793.

Specification of Letters Patent.

Patented May 28, 1912.

Original application filed May 11, 1906, Serial No. 316,250. Divided and this application filed March 12, 1907. Serial No. 361,957.

*To all whom it may concern:*

Be it known that I, JONAS W. AYLSWORTH, a citizen of the United States, residing at 223 Midland avenue, East Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Making Duplicate Phonograph-Records, of which the following is a description.

This application is a division of United States Letters Patent No. 855,605, granted June 4, 1907.

My invention relates to improved apparatus for making duplicate phonograph records, and my object is to provide apparatus for the purpose by which duplicate phonograph records may be produced at low cost, of superior quality, and whereby the percentage of imperfect records or "discards" obtained in actual manufacture will be very largely reduced.

In the present development of the phonographic art, it is possible to make matrices or molds which for all practical purposes are mathematically exact negative copies of the original master records, and several processes have been suggested and commercially used for obtaining duplicates from these matrices or molds. In a practical duplicating process, it is important that the temperatures used should not be too high, since the material from which the records are made contains considerable quantities of free stearic acid, which in the presence of a high temperature attacks and roughens the surface of the mold, even when the latter is protected by a nonoxidizing film of gold or nickel. These molds are very expensive and the slightest roughening is manifested in the reproduction from a record obtained from the same. Hence, it is important that the temperature should be kept in the neighborhood of the melting point of the material, or at best, only a few degrees above the same, in order that the life of the molds may be prolonged as much as possible. In working with the material at relatively low temperatures another difficulty is encountered, namely, the formation of air and gas bubbles, which appear on the surface of the record. These bubbles are sometimes caused by the trapping of air in the mold, even when great care is taken to avoid the diffi-

culty, and some are caused by the decomposition of the material in its original manufacture, or when scrap material is re-melted. The low temperature at which the material is worked makes it more or less viscid, and hence the bubbles do not have the opportunity of freely escaping, but move sluggishly through the mass.

By my present invention, I am enabled to produce duplicate records in a highly efficient and economical manner, the material being maintained in a molten state at not necessarily more than a few degrees above the melting point, so as to prevent it from attacking and corroding the mold, while at the same time, the operation is such that air and gas bubbles are effectively prevented from appearing on the record surface. To this end, the invention consists in the provision of apparatus for making duplicate records by centrifugal force, the mold being rotated at a sufficiently high speed and the molten material being introduced therein so as to be forced outwardly and distributed evenly around the entire bore of the mold, the mold being heated to about the temperature of the molten material, so that when the molten material is introduced therein, it will not chill on the mold, but will retain its fluid state, thereby permitting its complete and uniform distribution to be effected and allowing all bubbles to be displaced and forced into or through the body of material. This forcing of the bubbles inwardly away from the surface of the record can be effected rapidly and perfectly, since the tendency of the material to displace the bubbles, (provided the speed of rotation is high enough) may be made very much more decided than if the bubbles are allowed merely to float to the surface as at the present time. Consequently, by using centrifugal force, bubbles may be effectively forced back from the record surface even when such bubbles are so minute that their tendency to rise to the surface of the material is not sufficient to overcome the natural viscosity of the material. Yet, these very minute bubbles which are due to decomposition within the material are prominent enough to seriously affect the character of the reproduction. Having introduced the molten material in the rapidly turning mold, so as



to uniformly distribute the material over the bore of the mold, it is of course important that the mold should continue to rotate until the material becomes hard enough to retain its shape, but obviously the speed of rotation can be gradually reduced as the material becomes gradually hardened.

It will of course be understood, that the general principles of the invention can be carried out in many different ways, and in many different forms of apparatus. Preferably, however, the apparatus is one in which a practically continuous process can be carried on, a succession of molds being at all times undergoing treatment, so that when, for example, the step of introducing the molten material into one of the molds, is being carried out, the record will be practically finished in a previously introduced mold in which the several operations have been performed, all as I will more fully hereinafter describe and claim.

In the accompanying drawings, forming part of this specification, I illustrate a convenient apparatus for the purpose, said apparatus being simple in construction and capable of effective operation by comparatively unskilled labor.

In these drawings Figure 1, is a side elevation, partly in section, Fig. 2, a cross sectional view on the line 2—2 of Fig. 1, Fig. 3, a similar view on the line 3—3 of Fig. 1, Fig. 4, a horizontal sectional view on the line 4—4 of Fig. 1, Fig. 5, a longitudinal sectional view of the mold showing the end plates in position, and Fig. 6, an end view of the same illustrating the removable end plate.

In all of the above views, corresponding parts are represented by the same numerals of reference.

Carried by a heavy substantial base 1 are the frames 2—2, rigidly connected at their upper ends by a top plate 3. Mounted between the frames 2 are rollers 4—4, arranged in pairs and independently rotatable, so that they may turn at any desired speed. These rollers are not independently driven, but act merely as roller supports for the molds as the latter are rotated. The molds are rotated by a series of driving rollers 5—5 having preferably rubber or fiber peripheries, so as to increase the friction on the mold. These driving rollers are carried by brackets 6—6 and normally occupy the position shown in full lines (Fig. 4) so as to turn in a plane perpendicular to the axis of the molds. By skewing the driving rollers from their normal position as shown in dotted lines (Fig. 4) the molds would not only be rotated as desired, but will be moved longitudinally, as will be understood, so as to engage with and be supported by the successive idler rollers 4—4, moving in this way from the left to the right of the machine in

Fig. 1. The skewing of the driving rollers is effected by any suitable mechanism; for instance a rack bar 7, engaging toothed segments 8 on the bracket 6 of each roller and operated by a handle 9 whereby all the rollers will be moved axially. The driving rollers 5 are rotated by suitable mechanism, such as belts 10, engaging pulleys 11, carried by the driving rollers and driven by pulleys 12 on the main shaft 13. I illustrate the first two pulleys 12 at the left as being of the same diameter so as to rotate the molds at the same speed during the first two stages of the operation, the succeeding pulleys being of gradually reduced dimensions, so as to rotate the molds at less speed. Provision is made for cooling the molds after the material has been uniformly distributed therein, so as to effect a chilling and solidifying of the material, and for this purpose I illustrate a trough 14, located between the idler rollers 4, beginning with the second set thereof, since of course the molds should not be chilled during the introduction of the material therein. This trough is carried on arms 15 adapted to be normally pressed upwardly by a spring 16, so as to engage the molds with a light elastic pressure. The trough 14 is substantially filled with a loose absorbent material 17, such as fiber or sponge. Cooling water is admitted to the trough 14, through a perforated pipe 18, so as to always keep the absorbent material fully saturated. The inlet and overflow pipes are connected by rubber sections 19, so as to permit the trough to be moved up and down into and out of engagement with the molds. The trough 14 is moved downwardly when the rollers are skewed to permit the molds to move longitudinally. This movement may be derived from the rack bar 7 by forming the same with cams 20, with which engage rollers on the rods 21, the latter being connected to the pivoted arms 15. Obviously, as the rack bar 7 is moved to the right to skew the rollers, the trough 14 will be depressed so as to withdraw the absorbent material from contact with the molds.

The molten material may be contained in a tank 22 heated in any suitable way as for instance, by a steam coil 23. Mounted in the tank 22 is a simple form of pump 24, the piston 25 of which is adapted to travel below an inlet 26, so as to permit the molten material to enter the pump cylinder above the piston to thereby always give a definite charge of material, assuming the level of the latter, (shown in dotted lines, Fig. 1) to be constantly maintained. The pump 24 is carried on a bar 27 mounted to turn in brackets 28 secured to the sides of the tank 22. When the molds are being successively introduced into the machine, the pump is swung rearwardly to occupy an in-

clined position, resting on the stop 29. At all times, it will be observed that the pump cylinder is more or less immersed in the molten material, so as to be effectively heated by the same, and thereby preventing congealing. The discharge of the pump comprises a nozzle 30, adapted, when the pump cylinder is in a vertical position, to enter the mold 31. These molds are of any suitable type and are formed in any suitable manner. Preferably, they are provided with the ordinary end piece 32, on which the name of the selection is engraved or electrotyped, and with a removable end piece 33 at the other end, so that the molten material will be confined within the mold as the latter rotates. The removable end piece 33 fits the end of the mold very snugly, so as to prevent leakage of the molten material at this point, and is locked in position in any suitable way. For instance, I show the same as being formed with a series of cams 34, adapted to engage projections 35, formed on the mold, so that by inserting the end piece 33 in position, and giving it a partial turn, it will be locked frictionally firmly in place.

In the operation of apparatus of this general type, and assuming the tank 22 to contain the molten material (for instance the composition described in my Patent No. 782,375 dated February 14, 1905,) maintained at a temperature from 10 to 25 degrees above its melting point, I proceed as follows:—The handle 9 is operated so as to swing the driving rollers 5 to or toward the position shown in dotted lines (Fig. 4) and one of the molds 31 being placed on the first set of idler rollers 4—4 and engaged by the corresponding driving rollers 5, will by the latter be turned at the desired high speed and at the same time will be moved longitudinally to the position shown in Fig. 1. The handle 9 is now returned so that the mold will be rotated in this position. The pump 24 is now swung to its vertical position and the plunger is elevated, carrying the charge of molten material and discharging the same into the rotating mold, the temperature of which has been previously heated up to or preferably slightly a little more than the temperature of the molten material. The molten material will, therefore, be distributed uniformly throughout the mold and by reason of the centrifugal force developed will be maintained in its liquid state and evenly disposed over the record surface, so as to take a very perfect impression therefrom. Since the temperature of the material is somewhat higher than its melting point, and since the mold is preferably at or about the same temperature, the material remains perfectly fluid during the time that it is being disposed over the record surface, and consequently

ample opportunity is offered for displacing any bubbles, however minute, and forcing them radially inward. Even if these bubbles do not entirely escape through the liquid material, they are at least driven in from the record surface, which will therefore be perfect and free from bubbles. As soon as the charge of material has been delivered to the molds, the pump is swung rearwardly. The handle 9 is again operated to skew the driving rollers 5, and the mold with its charge of material therein will be advanced longitudinally so as to be engaged by the second driving roller and brought into position over the second set of idlers. At the same time, a new mold is introduced over the first set of idlers and is filled with material, as explained. When the mold with its charge of material therein has been thus advanced from the first section of the machine where the filling operation takes place, it will, when normally rotated by the successive driving rollers, be engaged by the cooling pad in the trough 14. These operations are repeated, the filled molds progressing step by step toward the right of the machine and being rotated at successively reduced rates, as the material is gradually cooled and becomes solid. I prefer to dispense with a driving roller in connection with the last set of idlers, at which point the material will be sufficiently solidified to retain its shape, the mold with its contents being then removed from the machine. The cap 33 is now removed and after the record has been contracted sufficiently away from the bore of the mold, it is removed. By always introducing a fixed and definite charge of material into the mold, the necessity for reaming the bore of the finished duplicate records is done away with, although this operation can be performed if considered desirable. It will furthermore be seen that by using two end caps, the duplicate records will be finished at both ends when removed from the mold.

If it is desired to provide the duplicate records with tapering bores, this may be effected by arranging the idler rollers 4 on an incline or by inclining the entire machine to a sufficient extent, whereby the material when introduced into the mold, will accumulate to a greater extent at the lower end than at the upper end and will set in this position, after which the bore, if not straight, may be finished by reaming, or a tapering bore may be entirely formed by a reaming operation, as will be understood.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. In apparatus for making duplicate phonograph records, the combination of devices for rotating a plurality of molds at a high speed in a substantially continuous



horizontal series, and for progressing the same throughout the series, and means for introducing a charge of molten material in each mold introduced at the forward end of the series, whereby the charge of material in each mold will be uniformly distributed therein by centrifugal force and will be permitted to cool and solidify as the molds are progressed longitudinally, substantially as set forth.

2. In apparatus for making duplicate phonograph records, the combination of devices for rotating a plurality of molds at a high speed in a substantially continuous horizontal series, and for progressing the same throughout the series, and a pump so arranged that its nozzle may enter each mold introduced at the forward end of the series, said pump being connected with a source of molten material whereby the charge of material introduced in each mold will be uniformly distributed therein by centrifugal force, and will be permitted to cool and solidify as the molds are progressed longitudinally, substantially as set forth.

3. In apparatus for making duplicate phonograph records, the combination of devices for rotating a plurality of molds at high speed in a substantially continuous horizontal series, and for progressing the same throughout the series, a tank for containing the molten material and a pump mounted in said tank and whose nozzle is arranged to enter each mold introduced at the forward end of the series, whereby a charge of molten material may be introduced within each mold immediately after its addition to said series so as to be uniformly distributed therein by centrifugal force, and be permitted to cool and solidify as the molds are progressed longitudinally, substantially as set forth.

4. In apparatus for making duplicate phonograph records, the combination with means for rotating the mold at high speed, of a tank for containing molten material, and a pump pivotally mounted in said tank, and having a nozzle adapted to be swung into position to enter said mold, substantially as set forth.

5. In apparatus for making duplicate phonograph records, the combination of devices for rotating a plurality of molds at high speed in a substantially continuous horizontal series, and for progressing the same throughout the series, means for introducing a charge of molten material in each mold introduced at the forward end of the series, whereby the charge of material in each mold will be uniformly distributed therein by centrifugal force, and means for applying a cooling media to the successive molds so as to solidify the charges of material therein as the molds are progressed longitudinally, substantially as set forth.

6. In apparatus for making duplicate phonograph records, the combination with means for rotating the mold at a high speed, of means for introducing a charge of molten material within the mold, means for applying cold to the mold to chill its contents, and means for successively reducing the speed of rotation of the mold, substantially as set forth.

7. In apparatus for making duplicate phonograph records, the combination of a pair of idler rollers, a driving roller co-operating with the same, means for skewing the driving roller, a mold supported by the idler rollers and advanced longitudinally by the driving roller, and means for introducing a charge of molten material to the rotating mold, substantially as set forth.

8. In apparatus for making duplicate phonograph records, the combination of a series of pairs of idler rollers, a series of driving rollers co-operating with the same, a series of molds supported by the idler rollers, and driven by the driving rollers, means for causing the driving rolls to advance the molds successively with respect to the idler rollers, and means for introducing charges of molten material into the successive molds, substantially as set forth.

9. In apparatus for making duplicate phonograph records, the combination of successive pairs of idler rollers, a series of driving rollers co-operating with the same, a series of molds supported by the idler rollers and driven by the respective driving rollers, means for introducing charges of molten material successively to the said molds, and means for cooling the molds after material has been introduced therein, substantially as set forth.

10. In apparatus for making duplicate phonograph records, the combination of successive pairs of idler rollers, a series of driving rollers arranged to be swung pivotally and co-operating with the idlers, a series of molds carried by the idler rollers and rotated and advanced longitudinally by the driving rollers, and means for introducing charges of molten material successively to said molds, substantially as set forth.

11. In apparatus for making duplicate phonograph records, the combination of successive pairs of idler rollers, a series of driving rollers arranged to be swung pivotally and co-operating with the idlers, a series of molds carried by the idler rollers and rotated and advanced longitudinally by the driving rollers, means for introducing charges of molten material successively to said molds, and means for cooling the molds after the introduction of the molten material therein, substantially as set forth.

12. In apparatus for making duplicate phonograph records, the combination of a pair of idler rollers, a driving roller co-

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- operating with the same, a mold supported by the idler rollers and rotated by the driving roller, means for moving the driving roller pivotally so as to advance the mold 5 longitudinally, means for normally applying cold to the rotating mold, and means for withdrawing the cooling media therefrom when the driving roller is moved pivotally, substantially as set forth.
- 10 13. In apparatus for making duplicate phonograph records, the combination of a pair of idler rollers, a pivotally mounted driving roller cooperating with the same, a mold supported by the idler rollers and rotated by the driving roller, a cooling pad 15 normally in contact with said mold, and means for simultaneously skewing the driving roller and withdrawing said pad from the mold, substantially as set forth.
- 20 14. In apparatus for making duplicate phonograph records, the combination of a pair of idler rollers, a driving roller cooperating with the same, a mold supported

by the idler rollers and rotated by the driving roller, and a pivotally mounted pump 25 normally moved away from the mold but adapted to be moved to a position where the pump nozzle will enter the mold, substantially as set forth.

15. A coreless cylindrical mold for the 30 production of duplicate phonograph records, having a plurality of fixed stops at one end thereof and provided with a fixed end plate and a removable end plate, the latter having a series of cams thereon for 35 engaging the stops on the mold, whereby the removable end plate may be locked frictionally in position, substantially as set forth.

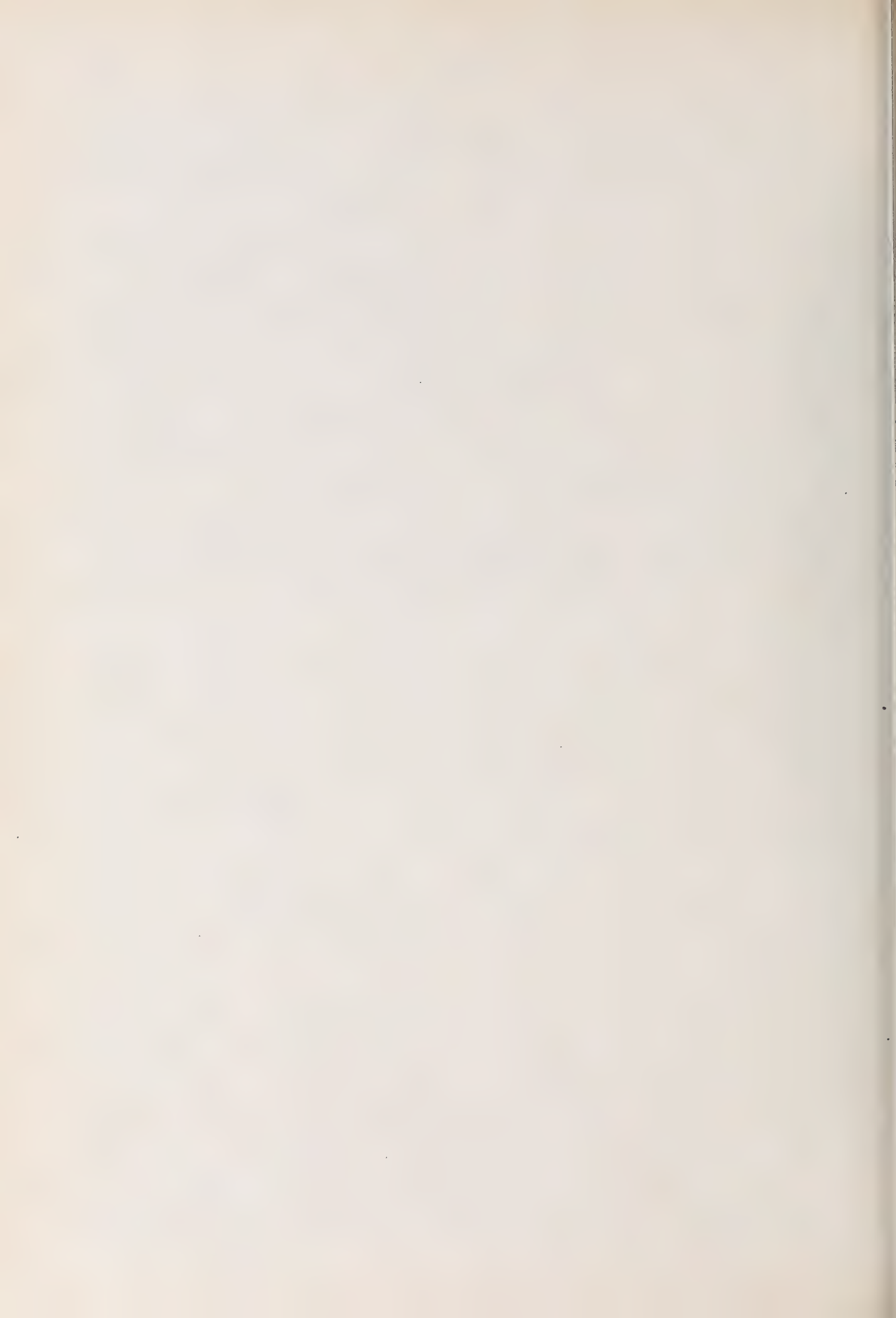
This specification signed and witnessed 40 this 9th day of March 1907.

JONAS W. AYLSWORTH.

Witnesses:

FRANK D. LEWIS,  
FRANK L. DYER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."





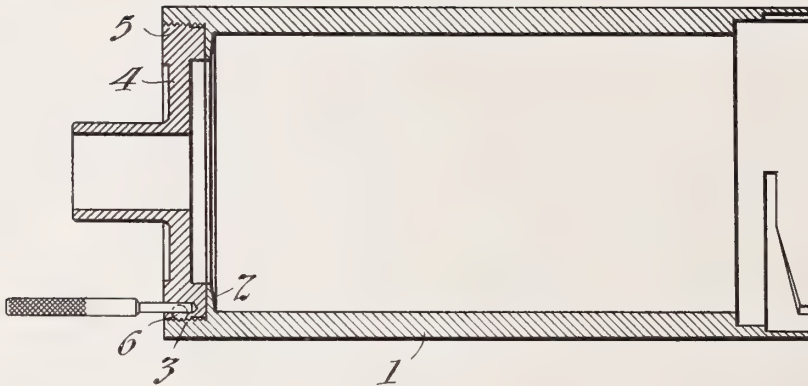


A. F. WURTH.  
 PHONOGRAPH RECORD MOLD.  
 APPLICATION FILED OCT. 8, 1908.

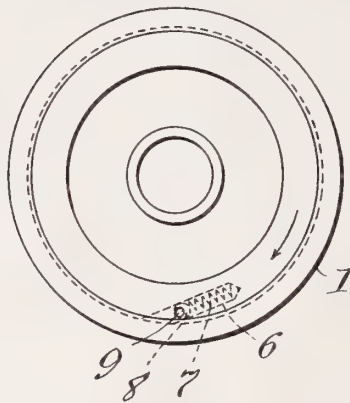
1,027,788.

Patented May 28, 1912.

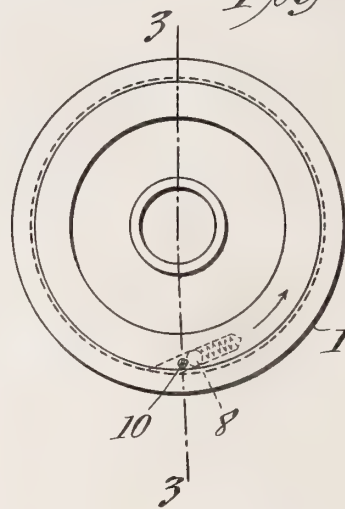
*Fig. 3*



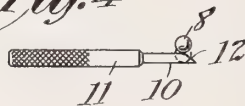
*Fig. 1*



*Fig. 2*



*Fig. 4*



*Witnesses:*  
 Frank D. Lewis  
 Delos Holden

*Inventor:*  
 Albert F. Wirth  
 by Frank L. Owen  
 Atty.

# UNITED STATES PATENT OFFICE.

ALBERT F. WURTH, OF ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH-RECORD MOLD.

1,027,788.

Specification of Letters Patent.

Patented May 28, 1912.

Application filed October 8, 1908. Serial No. 456,697.

*To all whom it may concern:*

Be it known that I, ALBERT F. WURTH, a citizen of the United States, and a resident of Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Record Molds, of which the following is a specification.

My invention relates to phonograph record molds or matrices of tubular form, and has for its object the provision of a removable end piece therefor, improved locking means being provided for preventing the removal of said end piece, said means being capable of being readily unlocked whenever it is desired to remove the end piece from the mold.

In order that the invention may be more clearly understood, reference is hereby made to the accompanying drawing, of which—

Figure 1 is an end view of a tubular mold having an end piece constructed in accordance with my invention and locked thereto; Fig. 2 is a similar view showing the manner in which the end piece is unlocked from the mold; Fig. 3 is a section on line 3—3 of Fig. 2, and Fig. 4 is a detail view showing the key or instrument for unlocking the end piece and the ball which forms a part of the lock.

In the structure shown the matrix or mold 1 is of tubular form and carries upon its bore a negative representation of a phonograph sound record, said mold being formed with an internal flange 2, and the bore of said mold beyond said flange being threaded as shown at 3. The end piece 4 is threaded at 5 to engage the thread 3, and has a recess or socket 6 within which is placed a spiral spring 7, one end of the same abutting against the bottom of said recess, and a ball 8 is placed in said recess against the other end of said spring. The recess 6 preferably extends inwardly from the periphery of the end piece 4 in a line forming a sharp acute angle with the tangent to the periphery of the end piece at the point thereon from which the recess starts, the recess extending inwardly in a direction contrary to that in which the end piece moves when being screwed into place. There is an opening or key-hole 9 extending into the end piece in a direction transverse to that of the recess

6 and of a size suitable for receiving the reduced end 10 of the key 11, said end being formed with a sloping surface 12.

The spring 7 and ball 8 having been placed within the recess 6, the end piece 4 is applied to the mold and rotated in the direction indicated by the arrow (Fig. 1) whereby the thread 5 engages with the thread 3 of the mold, and the end piece is screwed into the position shown in Fig. 3. During this rotation the ball 8 is forced inwardly against its spring 7 by engagement with thread 3 without binding. If now one should attempt to rotate the end piece 4 in the opposite direction, as indicated by the arrow in Fig. 2, it will be found that the ball 8 binds against the thread 3 of the mold, and prevents rotation. The end piece may be unlocked by inserting the end 10 of the key 11 into the hole 9 in such position that the inclined surface 12 contacts with the ball 8 and moves it away from the thread 3 as shown in Fig. 2. The ball being thus held, the end piece may be unscrewed from the mold.

Instead of using a ball or sphere 8 movable blocks of other form may be employed to cooperate with the wedging surface 12.

Having now described my invention, what I claim is:

1. In phonograph molding apparatus, the combination with a cylindrical record mold provided with an internal flange near one end thereof and internally screw-threaded beyond the said flange, of a circular end piece having a screw threaded periphery adapted to be screwed into said mold into contact with said flange, said end piece having a recess extending inward from said periphery in a line forming an acute angle with the tangent to said periphery, a ball within said recess, and resilient means for exerting outward pressure upon said ball, substantially as described.

2. In phonograph molding apparatus, the combination with a cylindrical record mold screw threaded adjacent one end thereof, of an end piece screw threaded to engage the thread upon said mold, and having a recess extending from the circle of engagement of said screw threads in a line forming an acute angle with the tangent to said circle,

a movable friction member within said recess and spring means within said recess exerting pressure upon said member to force it into contact with the thread on said mold, substantially as described.

3. In phonograph molding apparatus, the combination with a cylindrical record mold screw threaded adjacent one end thereof, of an end piece screw threaded to engage the thread upon said mold, and having a recess extending from the circle of engagement of said screw threads in a line forming an acute angle with the tangent to said circle, a movable friction member within said recess, and spring means within said recess exerting pressure upon said member to force it into contact with the thread on said mold, said

end piece having a key hole adjacent said member, substantially as described.

4. As a new article of manufacture, a disk-shaped end piece for record molds having a screw threaded periphery and a recess extending inward from said periphery in a line forming an acute angle with the tangent to said periphery at the point thereon from which said recess starts, and a movable friction member within said recess, substantially as described.

This specification signed and witnessed this 30th day of Sept. 1908.

ALBERT F. WURTH.

Witnesses:

FRANK D. LEWIS,  
JOHN M. CANFIELD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."



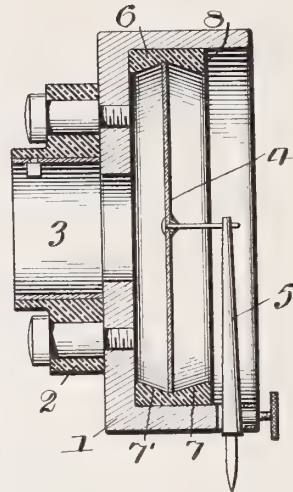


B. L. RINEHART.  
SOUND BOX FOR TALKING MACHINES.  
APPLICATION FILED JAN. 29, 1906.

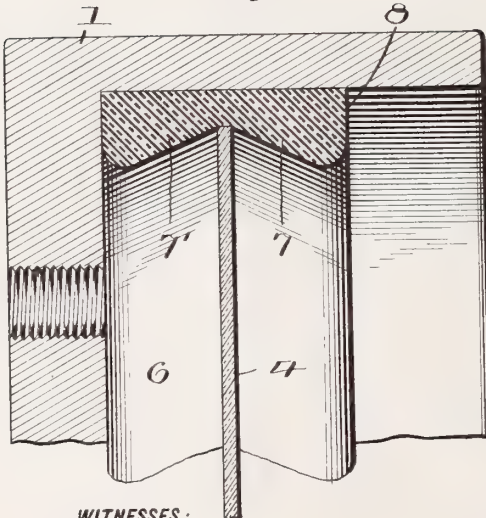
1,028,606.

Patented June 4, 1912.

*Fig. 1.*



*Fig. 2.*

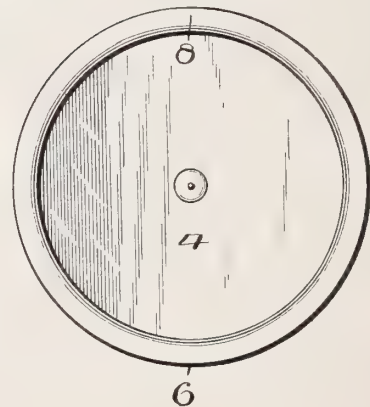


WITNESSES:

*A. E. Barry*

*Walter A. Halden*

*Fig. 3.*



INVENTOR

*Bentley L. Rinehart*

BY

*Wm. L. Rinehart*  
ATTORNEY.

# UNITED STATES PATENT OFFICE.

BENTLEY L. RINEHART, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

## SOUND-BOX FOR TALKING-MACHINES.

1,028,606.

Specification of Letters Patent.

Patented June 4, 1912.

Application filed January 29, 1906. Serial No. 298,339.

*To all whom it may concern:*

Be it known that I, BENTLEY L. RINEHART, a citizen of the United States, residing in Camden, in the county of Camden and State of New Jersey, have invented certain new and useful Improvements in Sound-Boxes for Talking-Machines, of which the following is a full, clear, and complete disclosure, reference being had to the accompanying drawings, forming part of this specification.

The main objects of this invention are to provide in a sound box, an improved mounting for a diaphragm; to provide a sound box having a diaphragm, in which the diaphragm may be readily removed and replaced without injury thereto; and to provide other improvements as will appear hereinafter.

In the drawings, Figure 1 is a longitudinal central section of a sound box constructed in accordance with this invention; Fig. 2 an enlarged fragmentary portion of the same; and Fig. 3 a front elevation of the diaphragm and its supporting ring.

Referring to the drawings, the improved sound box comprises an annular casing 1 having a cylindrical bore opening in the face thereof. The usual rubber tubular extension 2 is secured to the back of the casing, and within this extension is a tubular lining 3 communicating with the interior of the casing, whereby the sound box may be telescoped over the usual tubular support. The usual diaphragm 4 is mounted within the bore of the casing and is phonetically connected in any suitable manner to the stylus bar 5 which is mounted upon the casing in a well known manner to oscillate in a plane perpendicular to the diaphragm.

The diaphragm 4 is supported within and by a yielding ring 6 preferably made of soft rubber or other resilient material. This ring is externally cylindrical and fits snugly in the cylindrical bore of the casing, being frictionally retained in place. The interior surface of the ring is provided with an annular groove or circumferential depression, having inclined conical side walls 7-7' connected by a cylindrical wall. The periphery of the diaphragm rests within this groove, the cylindrical surface or wall of the periphery of the diaphragm bearing against the cylindrical wall of the groove. The conical side walls of the groove are tangent

to the edges of the diaphragm and the sides or flat faces of the diaphragm are out of contact with any part of the ring or sound box casing, the faces of the diaphragm being free to flex throughout their entire areas. The diaphragm is thus permitted to respond readily to the action of the sound waves or to the oscillation of the stylus bar.

The yielding ring is expanded into position over the diaphragm before being inserted into the casing, and the shape and dimensions of the ring are such that when the ring is in place over the diaphragm, the ring and diaphragm, as a unit, may be readily inserted into, or withdrawn from, the sound box casing, through the open end of the bore of the casing. The normal diameter of the interior groove in the ring may be slightly smaller than the diameter of the diaphragm, so as to compress the diaphragm radially through the resiliency of the ring; or the normal diameter of the groove may be of substantially the same diameter as the diameter of the diaphragm to hold the diaphragm without exerting any appreciable pressure thereon.

One of the purposes involved in mounting the diaphragm is to support the diaphragm at its periphery or circumferential wall only, and this purpose may be realized by using the grooved ring as described, or the ring might be omitted, and other similar means substituted for accomplishing the same end. The shape of the ring may be varied from that described or the ring may be made integral with the sound box casing instead of detachable therefrom, the yielding quality of the ring serving to permit of the insertion or removal of the diaphragm.

This invention has been illustrated only in its preferred form, but various changes, some of which have been suggested above, may be made in the construction shown, without departing from the spirit of this invention, or the scope of the appended claims.

Having thus described my invention, I claim and desire to protect by Letters Patent of the United States:

1. In a sound box the combination with a casing provided with a cylindrical bore having one end open to the full diameter of the bore, of a solid resilient gasket having a cylindrical periphery, said gasket being frictionally and removably retained in said cas-

ing by the engagement of the periphery of  
said gasket with the cylindrical wall of  
said bore, and a diaphragm entirely sup-  
ported by said gasket and having its oppo-  
5 site plane surfaces out of engagement with  
said gasket.

2. In a sound box the combination with a  
casing provided with a cylindrical bore hav-  
ing one end open to the full diameter of the  
10 bore, of a solid resilient gasket having a  
cylindrical periphery of the same diameter  
as said bore and frictionally retained in said  
casing by the engagement between the pe-  
riphery of said gasket and the cylindrical

wall of said bore, said gasket being pro- 15  
vided with an internal annular groove hav-  
ing side walls diverging from the bottom  
thereof toward the center of said gasket,  
said diaphragm being supported by said  
gasket by the frictional engagement of the 20  
circumferential edge of said diaphragm  
with the walls of said groove.

In witness whereof I have hereunto set  
my hand this 26th day of January, 1906.

BENTLEY L. RINEHART.

Witnesses:

WM. EARL,

CHAS. K. BENNETT.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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J. I. GEMMILL.

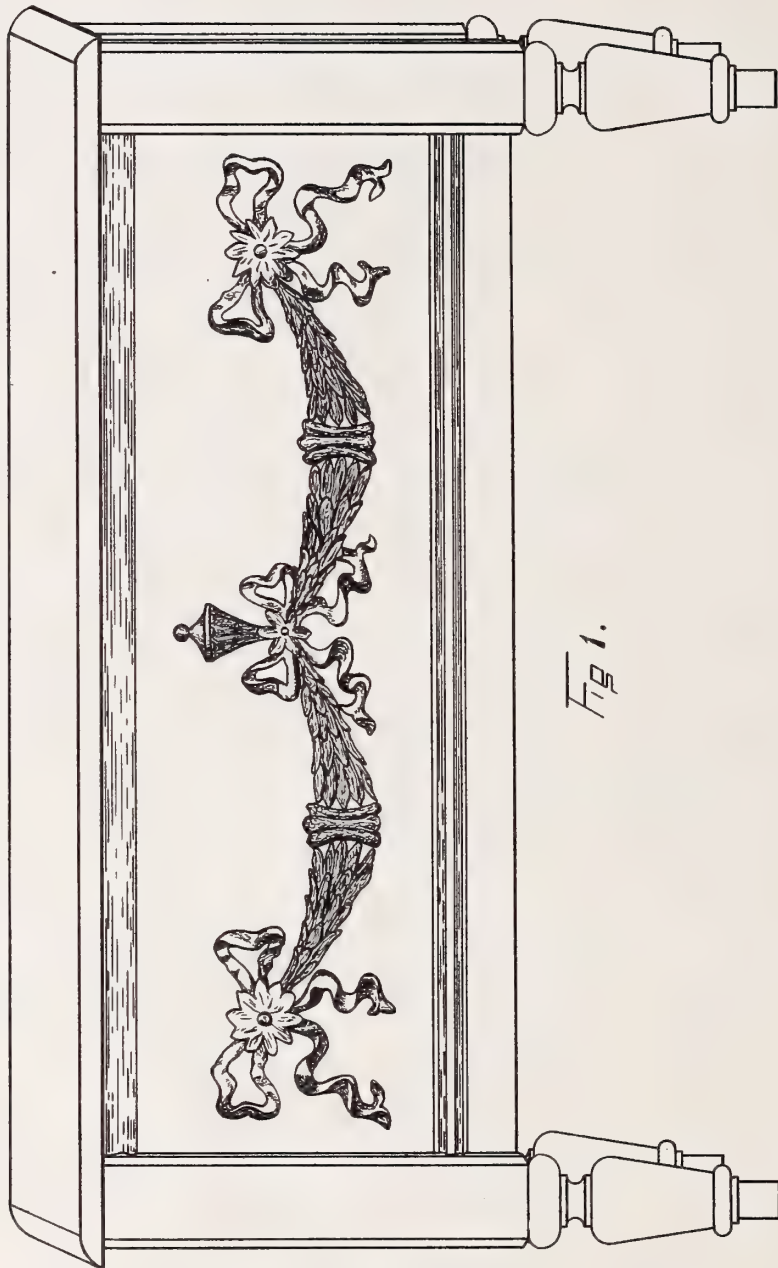
AUTOMATIC GRAPHOPHONE OF THE DISK RECORD TYPE.

APPLICATION FILED MAR. 1, 1911.

1,028,707.

Patented June 4, 1912.

12 SHEETS-SHEET 1.



Witnesses:  
A. J. Keller  
Warren Ramsey

Inventor,  
James I. Gemmill.

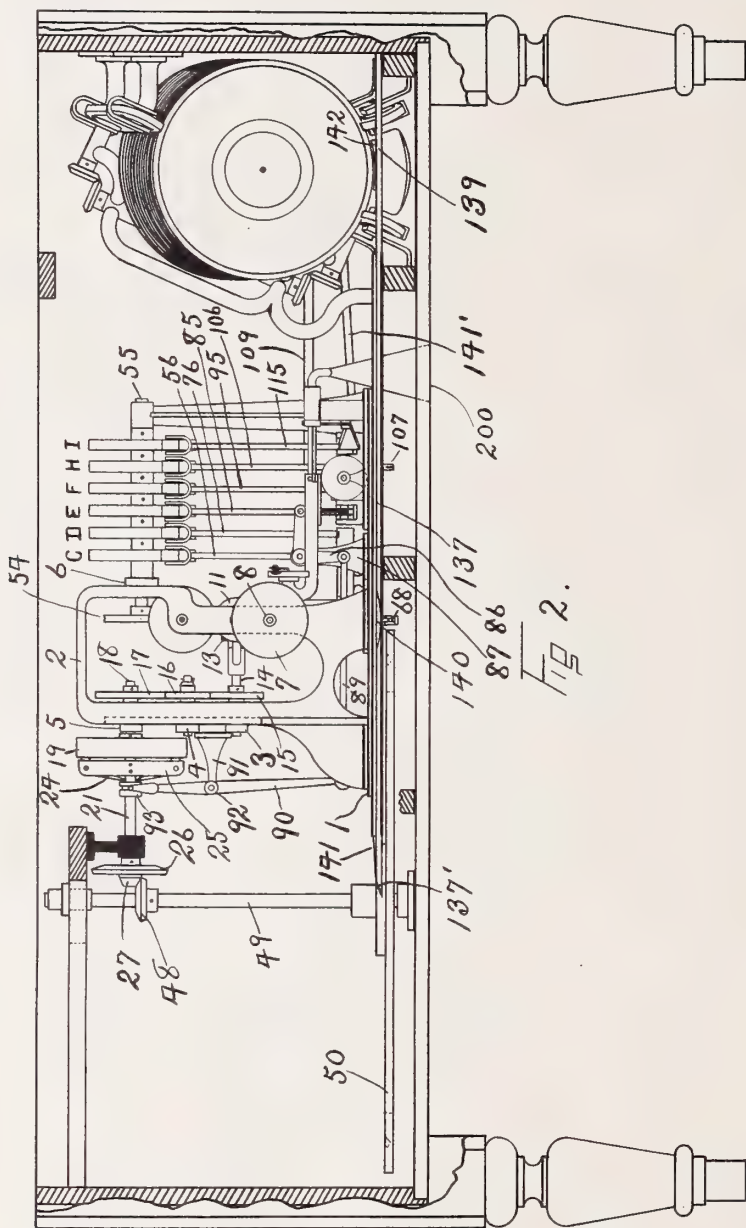


J. I. GEMMILL.  
 AUTOMATIC GRAPHOPHONE OF THE DISK RECORD TYPE.  
 APPLICATION FILED MAR. 1, 1911.

1,028,707.

Patented June 4, 1912.

12 SHEETS—SHEET 2.



Witnesses:  
 A. J. Fuller  
 Warren Ramsey

Inventor,  
 James I. Gemmill,





J. I. GEMMILL.  
 AUTOMATIC GRAPHOPHONE OF THE DISK RECORD TYPE.  
 APPLICATION FILED MAR. 1, 1911.

1,028,707.

Patented June 4, 1912.

12 SHEETS—SHEET 3.

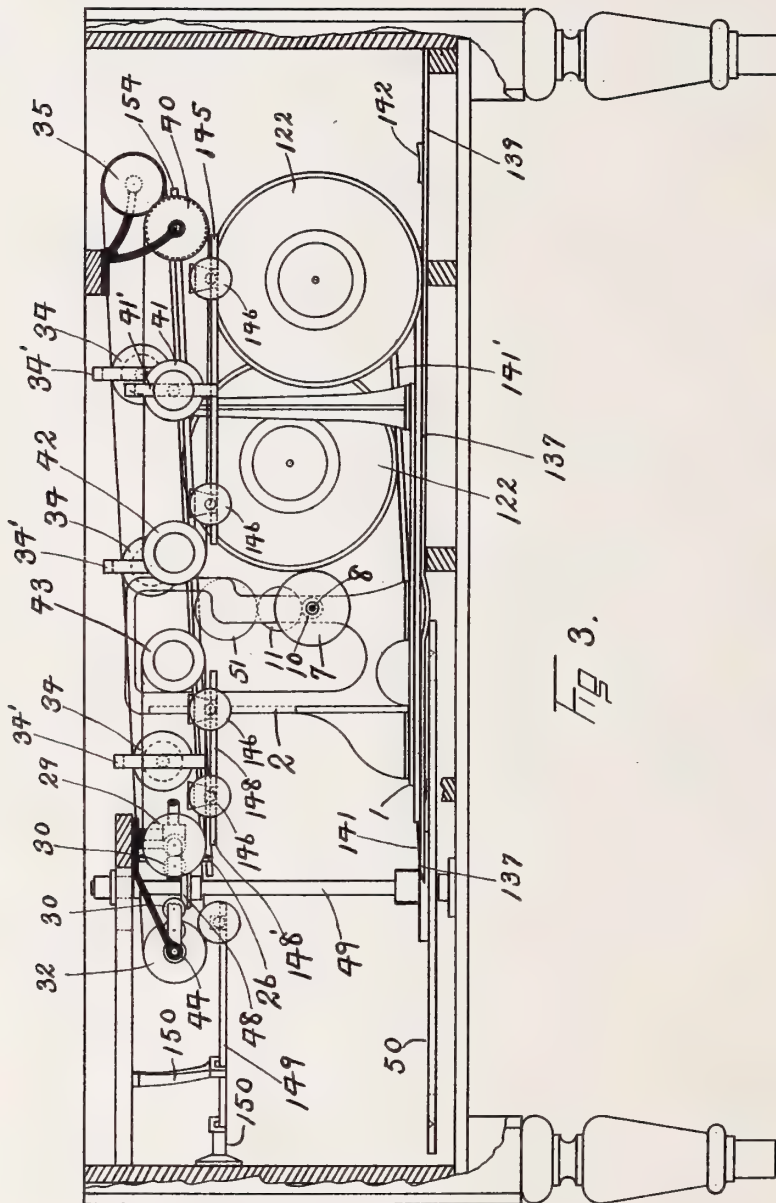


Fig. 3.

Witnesses:  
 A. J. Fuller  
 Warren Ramsey

Inventor,  
 James I. Gemmill.

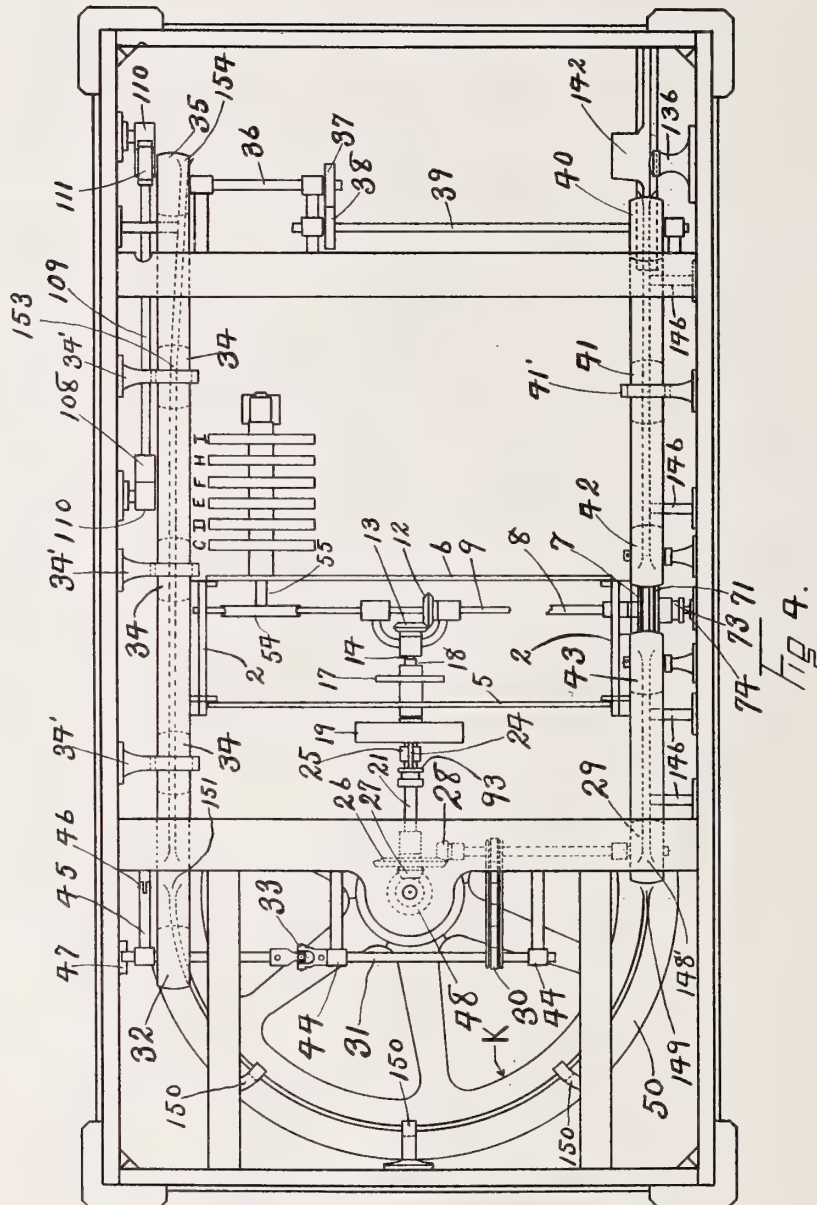


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1,028,707.

Patented June 4, 1912.

12 SHEETS—SHEET 4.



Witnesses:  
 A. J. Fuller  
 Warren Ramsey

Inventor:  
 James I. Gemmill.



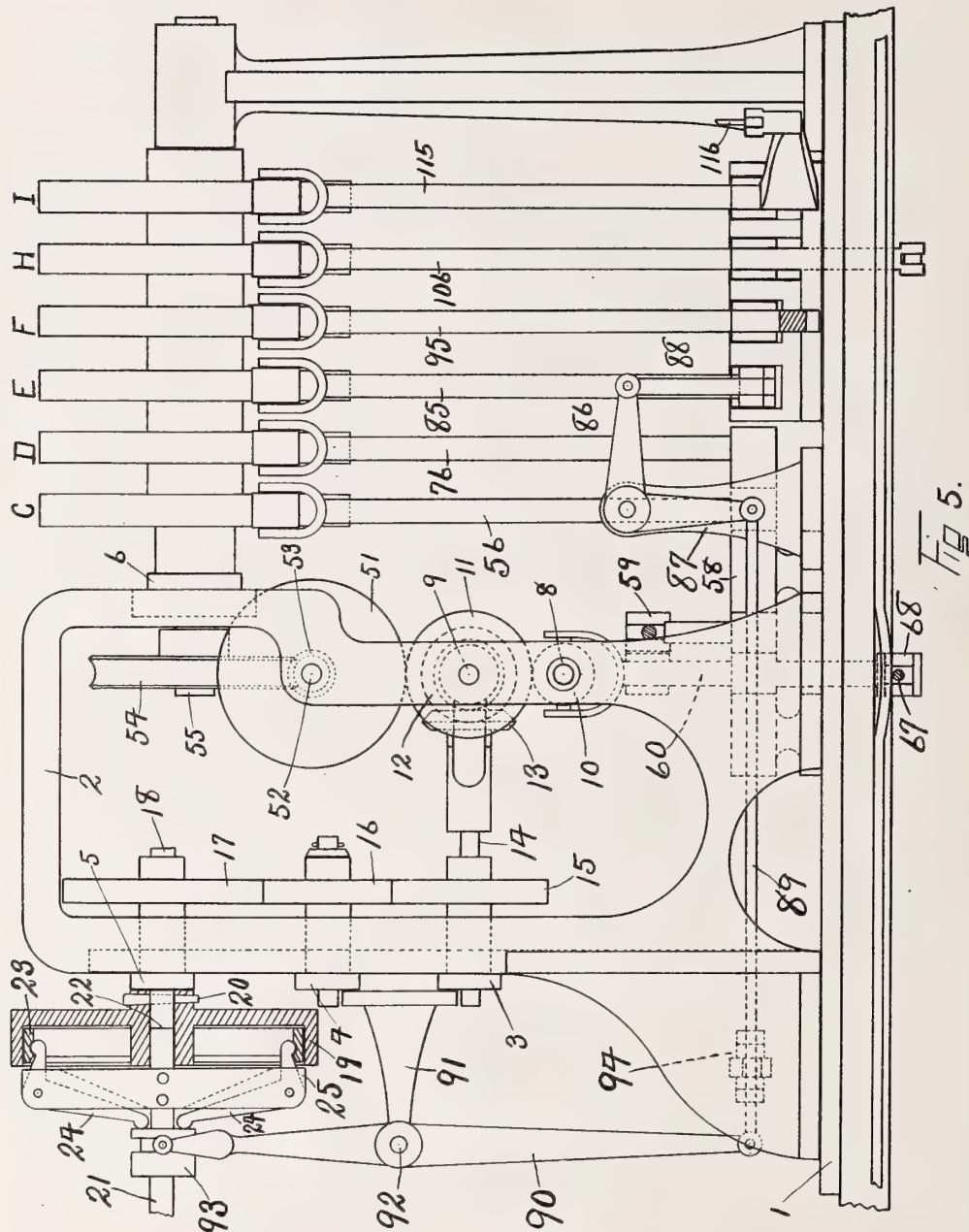


J. I. GEMMILL.  
 AUTOMATIC GRAPHOPHONE OF THE DISK RECORD TYPE.  
 APPLICATION FILED MAR. 1, 1911.

1,028,707.

Patented June 4, 1912.

12 SHEETS—SHEET 5.



Witnesses:  
 A. Miller  
 Warren Ramsey

Inventor,  
 James I. Gemmill.

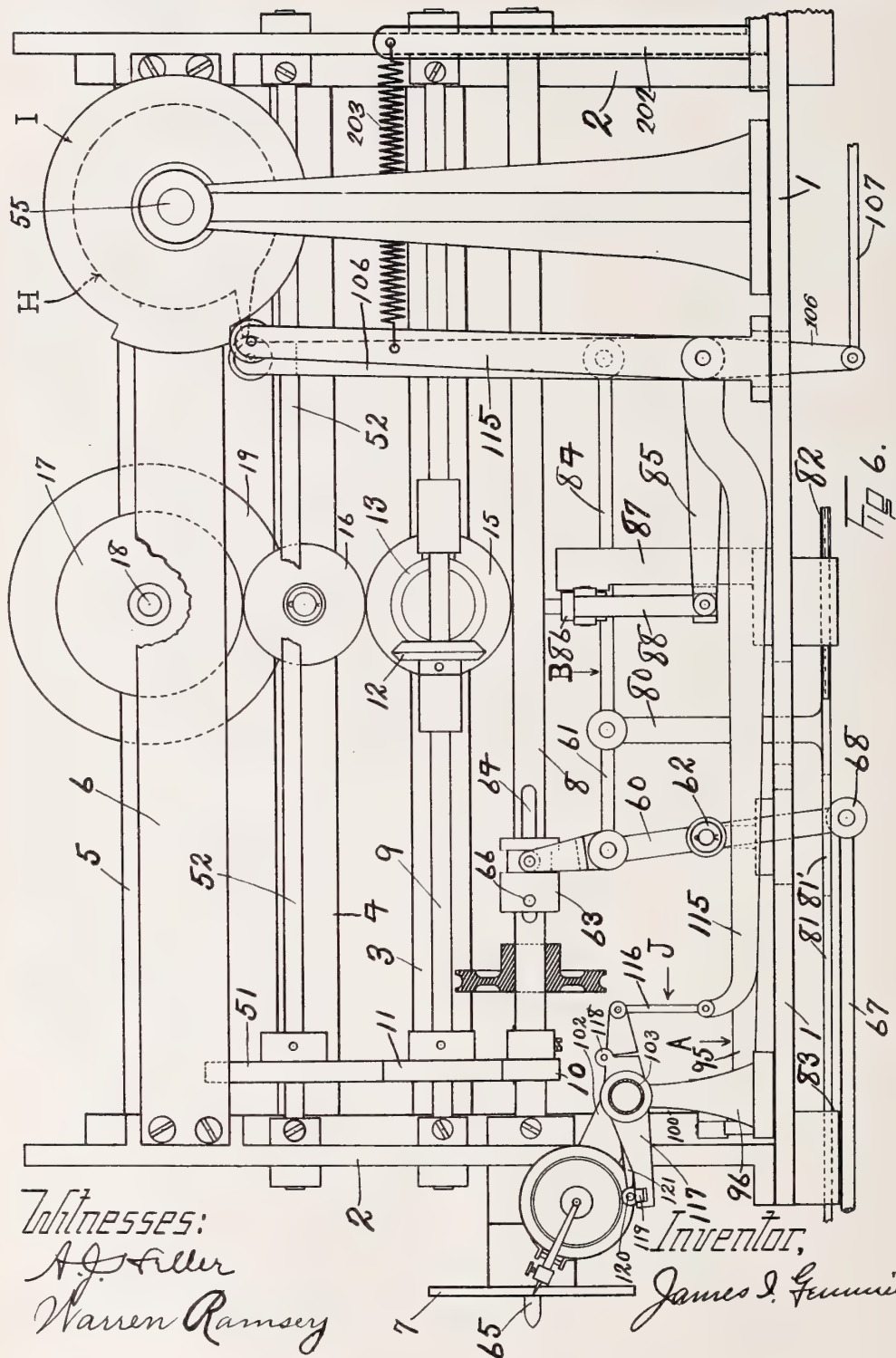


J. I. GEMMILL.  
 AUTOMATIC GRAPHOPHONE OF THE DISK RECORD TYPE.  
 APPLICATION FILED MAR. 1, 1911.

1,028,707.

Patented June 4, 1912.

12 SHEETS-SHEET 6.





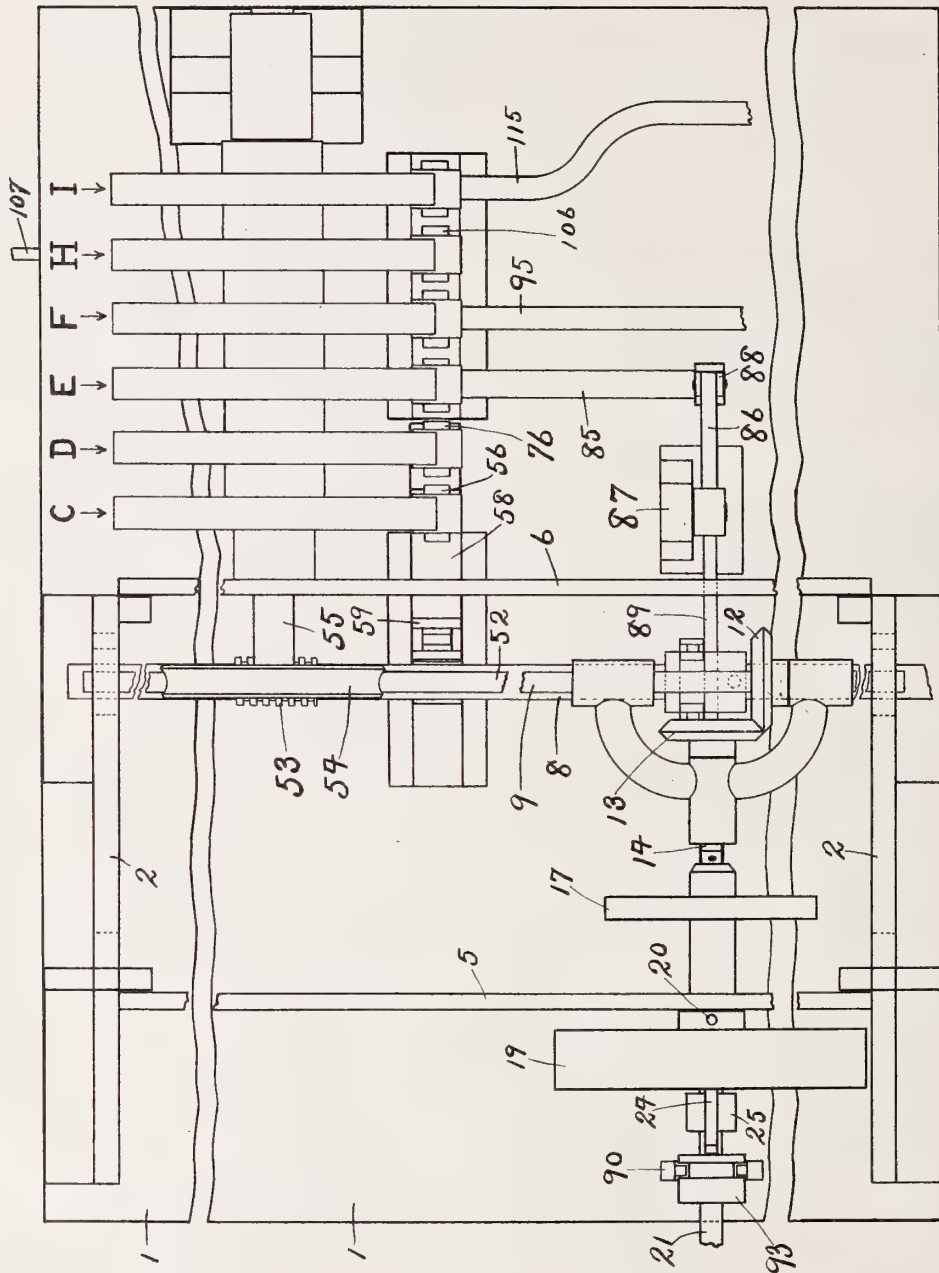


J. I. GEMMILL.  
 AUTOMATIC GRAPHOPHONE OF THE DISK RECORD TYPE.  
 APPLICATION FILED MAR. 1, 1911.

1,028,707.

Patented June 4, 1912.

12 SHEETS—SHEET 7.



Witnesses:  
 A. J. Heller  
 Warren Ramsey

Fig. 7.

Inventor,  
 James I. Gemmill.

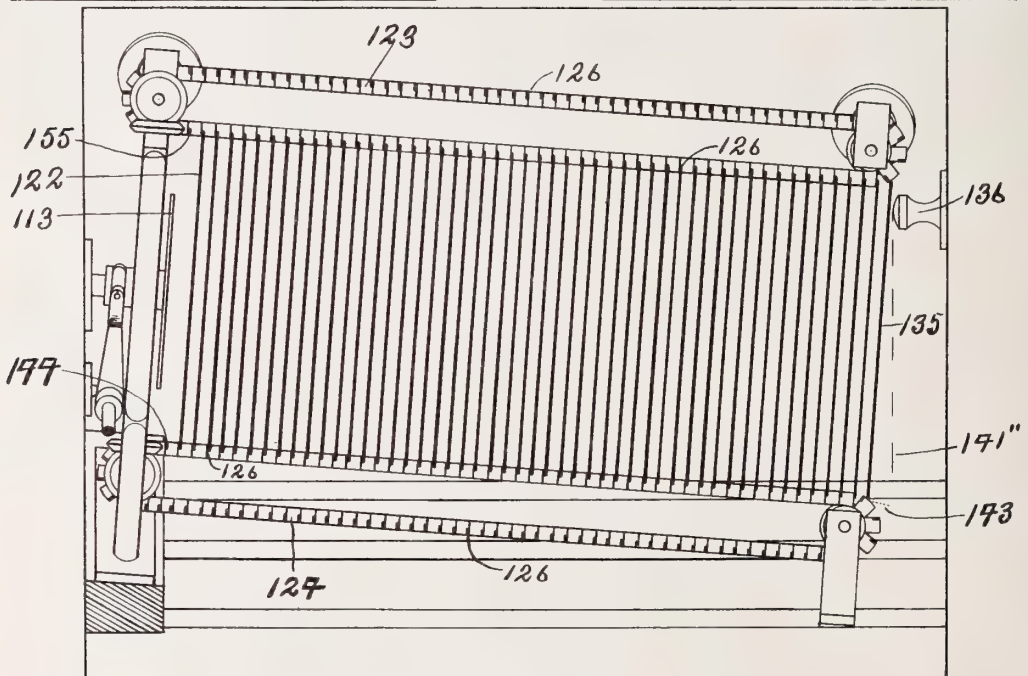
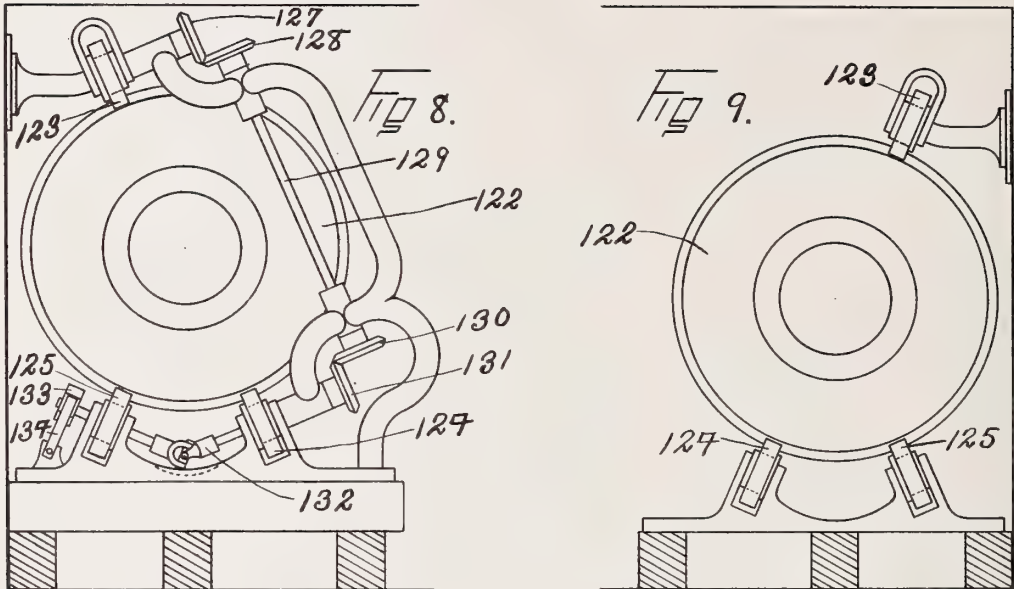


J. I. GEMMILL.  
 AUTOMATIC GRAPHOPHONE OF THE DISK RECORD TYPE.  
 APPLICATION FILED MAR. 1, 1911.

1,028,707.

Patented June 4, 1912.

12 SHEETS—SHEET 8.



Witnesses:  
 A. J. Haller  
 Warren Ramsey

Inventor,  
 James I. Gemmill.



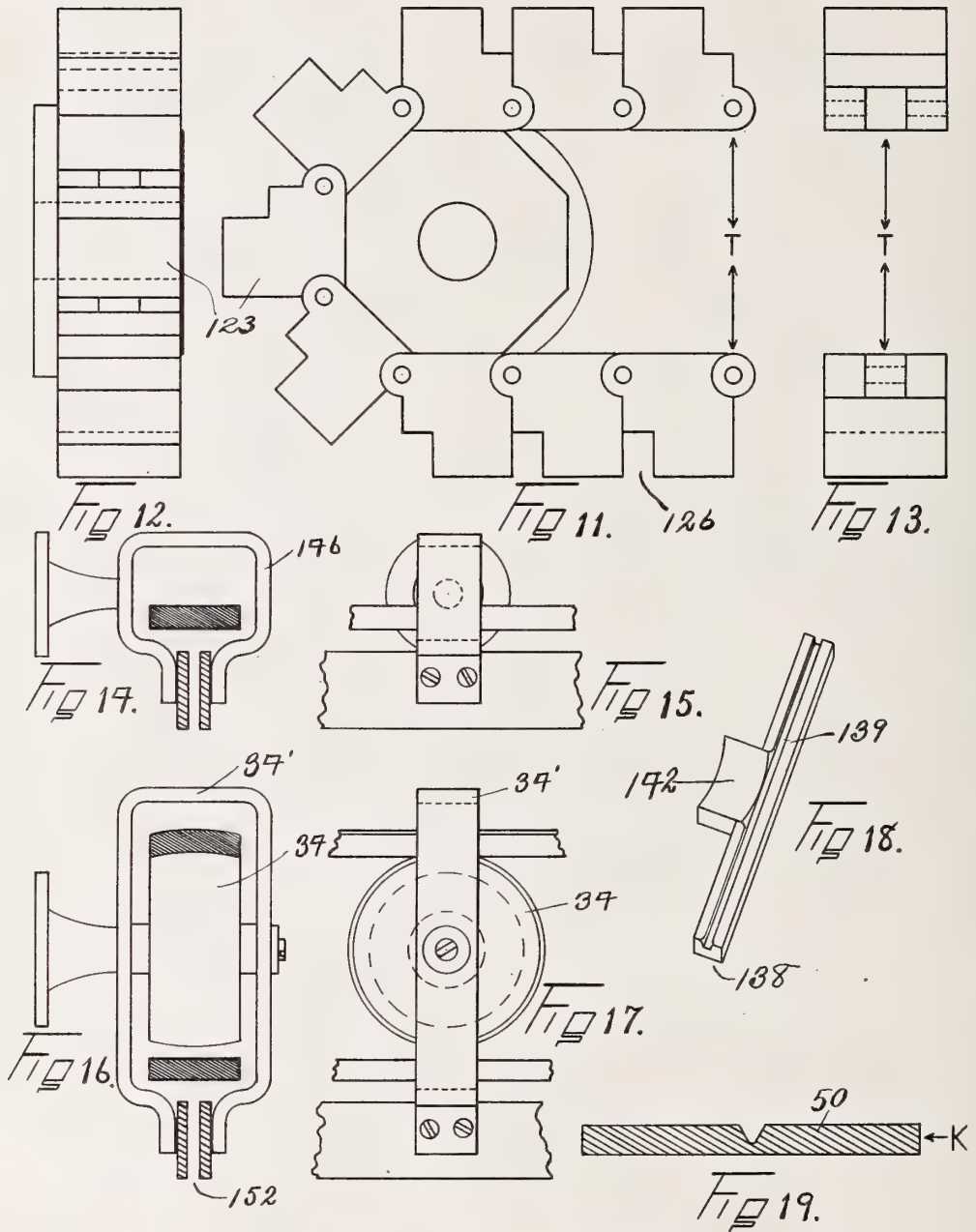


J. I. GEMMILL.  
 AUTOMATIC GRAPHOPHONE OF THE DISK RECORD TYPE.  
 APPLICATION FILED MAR. 1, 1911.

1,028,707.

Patented June 4, 1912.

12 SHEETS—SHEET 9.



Witnesses:  
 A. J. Fuller  
 Warren Ramsey

Inventor,  
 James I. Gemmill.

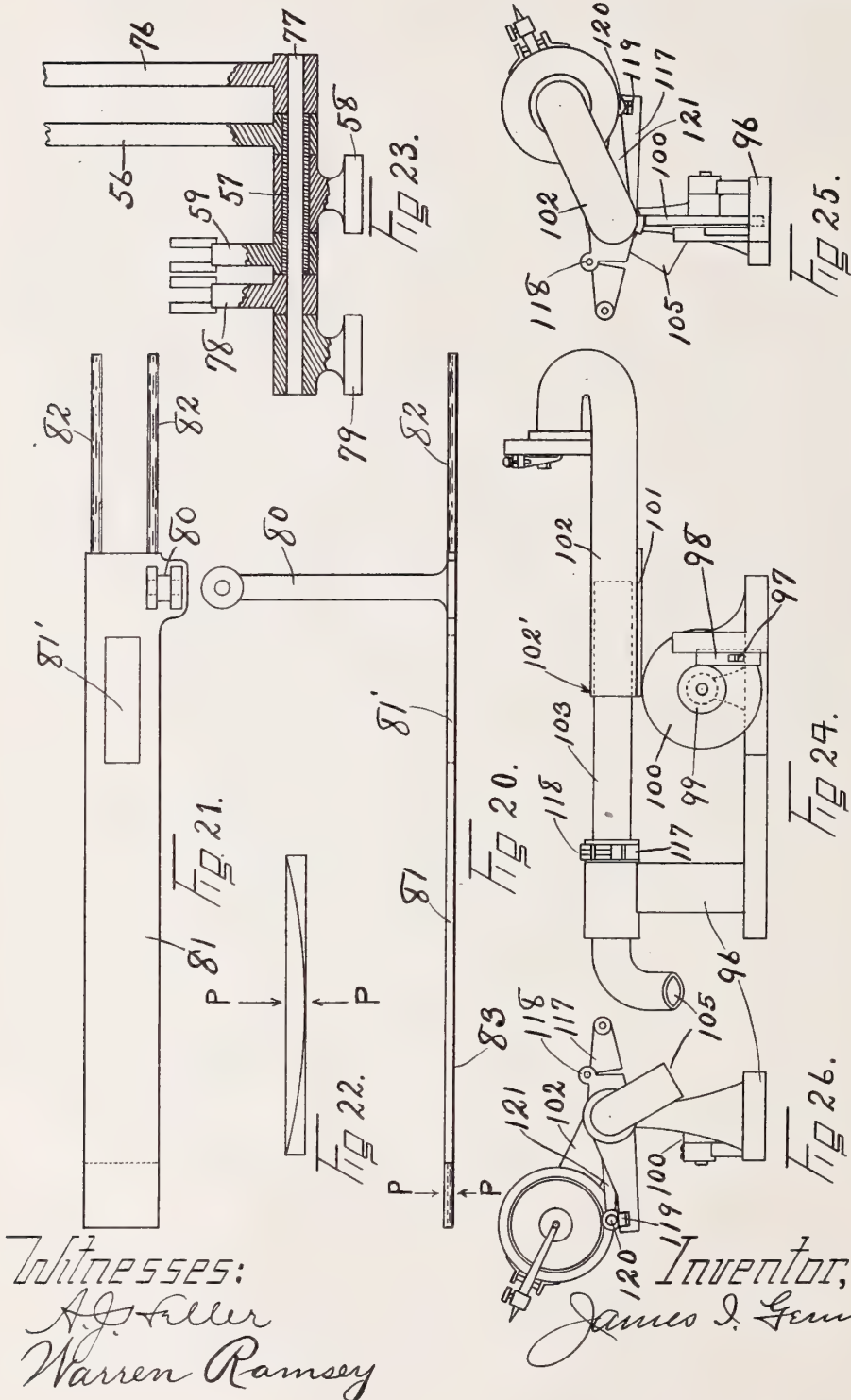


J. I. GEMMILL.  
 AUTOMATIC GRAPHOPHONE OF THE DISK RECORD TYPE.  
 APPLICATION FILED MAR. 1, 1911.

1,028,707.

Patented June 4, 1912.

12 SHEETS—SHEET 10.



Witnesses:  
 A. J. Miller  
 Warren Ramsey

Inventor,  
 James I. Gemmill.



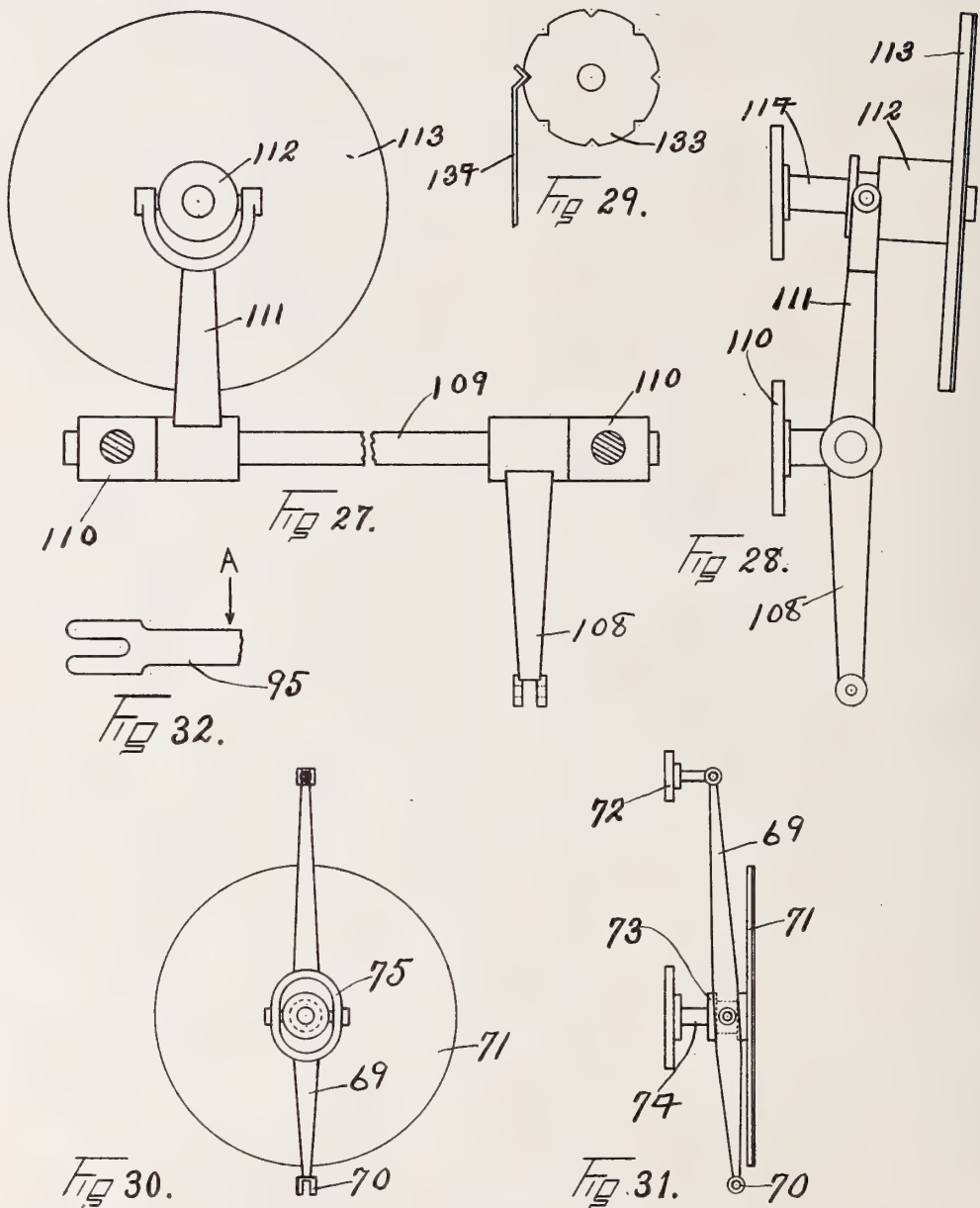


J. I. GEMMILL.  
 AUTOMATIC GRAPHOPHONE OF THE DISK RECORD TYPE.  
 APPLICATION FILED MAR. 1, 1911.

1,028,707.

Patented June 4, 1912.

12 SHEETS—SHEET 11.



Witnesses:  
 A. J. Haller  
 Warren Ramsey

Inventor,  
 James I. Gemmill.

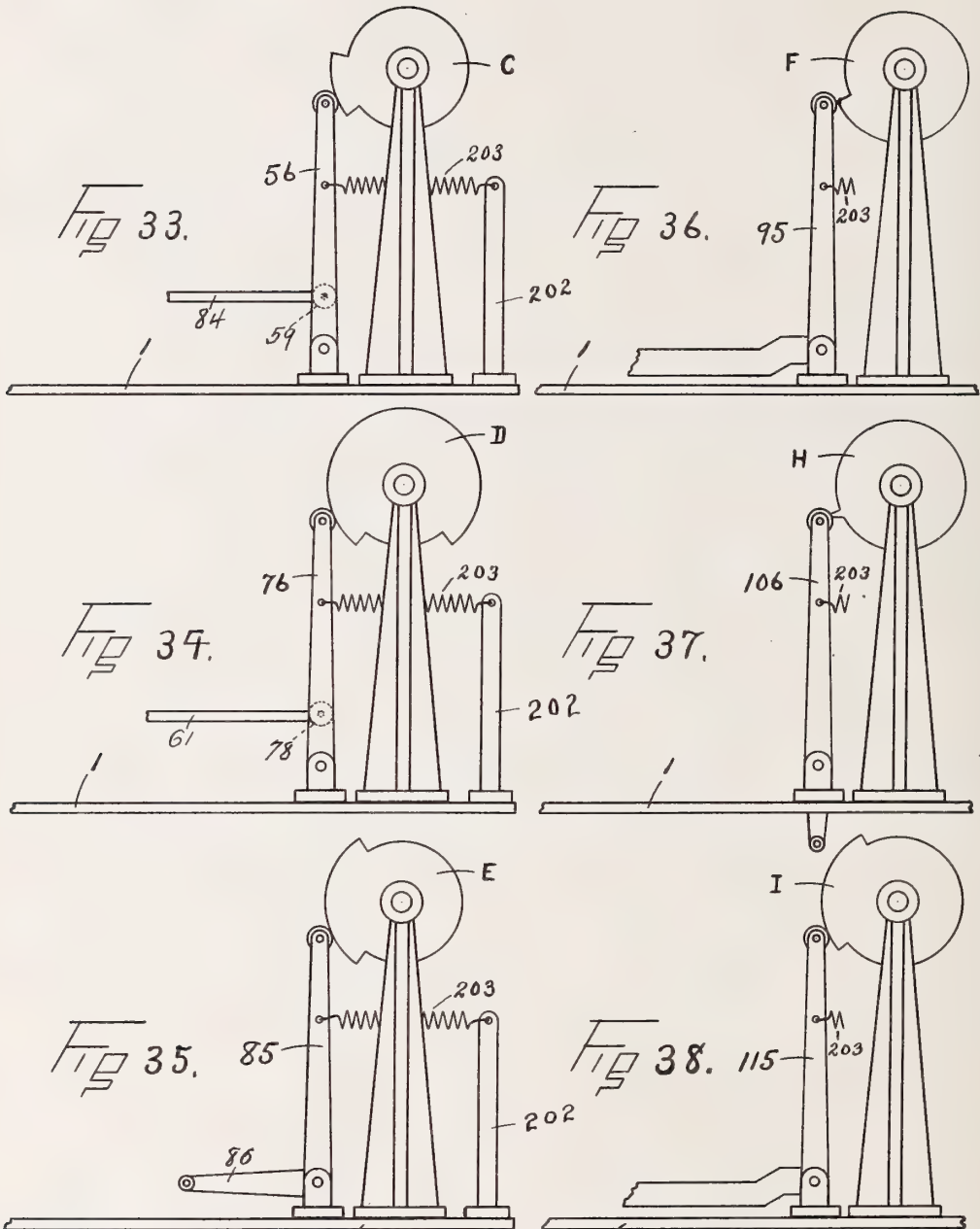


J. I. GEMMILL.  
 AUTOMATIC GRAPHOPHONE OF THE DISK RECORD TYPE.  
 APPLICATION FILED MAR. 1, 1911.

1,028,707.

Patented June 4, 1912.

12 SHEETS—SHEET 12.



Witnesses:  
 Warren Ramsey.  
 A. J. Fuller.

Inventor,  
 James I. Gemmill.

# UNITED STATES PATENT OFFICE.

JAMES I. GEMMILL, OF ORRVILLE, OHIO.

AUTOMATIC GRAPHOPHONE OF THE DISK-RECORD TYPE.

1,028,707.

Specification of Letters Patent.

Patented June 4, 1912.

Application filed March 1, 1911. Serial No. 611,671.

*To all whom it may concern:*

Be it known that I, JAMES I. GEMMILL, a citizen of the United States, resident of Orrville, county of Wayne, and State of Ohio, have invented a new and useful Improvement in Automatic Graphophones of the Disk-Record Type, of which the following is a specification.

The principle of the invention is herein explained, and the methods used to apply that principle so as to differentiate this invention from the prior art.

My invention relates to automatic mechanisms and particularly to a multiple disk-record graphophone.

My invention more particularly relates to mechanism of the character adapted to handle and play a large number of disk records of the type having a selection recorded on each side thereof and further adapted to turn the record and play the reverse side, from that last played, in an alternate manner. This arrangement provides a machine, excellent for the purpose of a continuous performance without any attendance whatever.

The silent period, or the time during which a record is changed and turned is very short and as the machine is electrically operated, it meets all of the requirements for this type of a machine.

In this construction, I have introduced novel mechanical features in the preferred forms of the several different mechanisms comprising the machine which are herein-after fully illustrated and described and in conformity with said illustration and description, will be fully set forth in the appended claims.

I attain the above results by using the mechanism disclosed in the drawings accompanying this specification and which forms a part thereof.

Reference will now be had to the drawings wherein—

Figure 1, shows the entire machine; Fig. 2, is a vertical front view of said machine as in Fig. 1, with the lid and front side removed and cut away respectively, and serves to disclose therein a portion of the mechanism and a bank of the records in position; Fig. 3, is a view similar to the last, except that the mechanism shown in Fig. 2, or the greater part thereof has been removed, and the elevated structure, comprising the elevated belts as a traveling member, and the tracks together with the necessary pulleys

are shown, and two records are also shown as they appear going to and from the playing position and on their respective tracks. Fig. 4, is a plan view of the machine, viewed from above and serves to show the whole system of belts and guide tracks and their relative position to the large transferring wheel. Fig. 5, is a front elevation of the principal actuating mechanism, comprising the cams, levers and other active elements. Fig. 6, is a side elevation of Fig. 5, as viewed from the right side thereof. Fig. 7, is a plan view from above, of Figs. 5, and 6, and shows all of the respective parts in their relative position, except the two housings which are set in, in the drawing, and the base plate, shafts, and connections are broken away, so as to permit this said condition. Fig. 8, is an elevation view of the chain sprocket wheels and frame work for same and the gearing adapted thereto, and represents the rear end of the chain carrying mechanism. Fig. 9, is an elevation view of the companion chain sprockets adapted to the front end of the said chain carrying mechanism. Fig. 10, is a semi-perspective view of the sides of the last two described figures respectively, combined to show their assembly position and including two of the chains mounted thereon, together with a series of records assembled in the said chains. Fig. 11, is a side elevation in enlarged form of one of the sprocket wheels, with a section of one of the said chains showing how it is adapted thereto. Fig. 12, is an edgewise view of the last figure, and serves to show the relative thickness of the chain blocks. Fig. 13, shows two block-links with male and female joint lugs respectively, being shown thereon. Fig. 14, is a side elevation of one of the elevated guide track brackets showing the said tracks in section thereon. Fig. 15, is another view of the same from the front. Fig. 16, is a side elevation of one of the combination guide track and pulley brackets showing a pulley and belt thereon and a portion of the guide track in section thereunder. Fig. 17, is another view of the same from the front. Fig. 18, is a perspective view of a portion of the lower track way, for the records, and showing the slide way over which the record passes to enter the track. Fig. 19, is a section of the large transferring wheel at point K, and serves to show the shape of the continuous circular record track formed thereon. Fig. 20, is a side ele-



vation view of the slide member, while Fig. 21, is another view of same. Fig. 22, is an enlarged end view of Fig. 20, as at point P, P, and serves to show how this end is shaped to conform with a certain depression in the record track. Fig. 23, is a detailed elevation view, partly in section, of two of the cam levers and bearings therefor and serves to show how they both operate upon one center. Fig. 24, is a plan view of the "sound box" or reproducer with its mounting. Fig. 25, and Fig. 26, are other views of Fig. 24, and serve to show the mechanism for traversing the reproducer along horizontally as well as elevating it to raise it from off a record when in a playing position. Fig. 27, is a rear elevation view of the advancing mechanism for the records showing the lever and compression plate without the central support. Fig. 28, is another view of the same including the central support. Fig. 29, is an eight tooth ratchet-wheel and spring detent therefor, in enlarged form, and again seen as a part of Fig. 8. Fig. 30, is a rear elevation view of the turn-table and the lever connected therewith, and shown without the central support. Fig. 31, is another view of same and includes the central support and base for same. Fig. 32, is diagrammatic of the extreme end of lever 95, where it connects with the pin 97, and shows the finger arrangement of same. Figs. 33 to 38 inclusive are detail views in side elevation of the actuating cams showing the engaging position of each cam with its follower.

In considering these drawings more particularly, it will be observed that similar numerals refer to similar parts throughout all of the disclosures.

Again referring to the drawings, in Fig. 2, is seen a base plate 1, upon which is mounted, a pair of housings, 2; these housings are joined together by bearing bars 3, 4, 5, and 6, and they all serve to contain the mechanism necessary to the main actuating portion of the machine. The rotating disk 7, is mounted on the semi-hollow shaft 8, Fig. 6, and which is geared to the shaft 9, shown in same figure by the gears 10, and 11; on this shaft 9, a wheel 12, is mounted, together with the necessary casting as a container for same; this wheel 12 is one of a pair of miter gears and a second similar gear wheel 13, co-acting with the wheel 12, is mounted on a cross shaft 14, and which carries a gear wheel 15, operating the idle gear 16, and the gear wheel 17, which rotates the shaft 18, upon which it is mounted; the shell of the friction clutch 19, is mounted on this last named shaft, by means of a pin 20 (see Fig. 5). The end of a second shaft 21, is seen at 22, within the member 19, wherein it has a bearing. This shaft serves to carry a flexible, inter-

mediate, connecting means between the two shafts 18, and 21, and in the preferred form, an ordinary friction clutch is used, comprising a split ring 23, and lever fingers 24, contained in a block 25, and which engage the said ring 23, to rotate it, and which are in turn rotatively carried by the said block 25, which is permanently attached to the shaft 21. Said shaft also carries a pair of bevel gear wheels, which are shown in Figs. 2 and 4, and there designated as 26, and 27, respectively. Considering Fig. 4, the gear wheel 26, is shown co-acting with a gear wheel 28, operating a shaft and pulley wheel 29, also, by means of a train of small gears 30, operating the shaft 31, and the pulley wheel 32; this shaft 31, is flexible, (for a purpose hereinafter mentioned,) by reason of the tumble-joint 33; motion, is transmitted from the wheel 32, by a heavy felt belt, being  $\frac{3}{4} \times 1\frac{1}{2}$ " in cross section dimension and running over idle wheels 34, to the pulley 35, which operates the shaft 36, and the gear wheel 37, which co-acting with the gear wheel 38, operates the shaft 39, and the pulley 40, upon which is mounted another belt of similar character and running over idle wheel 41, to the fixed pulley 42. Referring to pulley 29, a third similar belt is operated thereby and runs over the fixed pulley 43. The shaft 31, is in two sections connected by the tumble joint 33, that portion of the shaft operated by the train of gears 30 being journaled in bearings 44, and the remainder of the said shaft, together with the pulley 32, have a small range of flexibility upward, permitted by the tumble-joint and the fact that the outside bearing 45, in which the said remaining portion of the shaft is journaled is hinged at 46; the weight of the shaft and dependent parts thereon, is taken by a bearing block at 47. This completes what is termed the elevated movement, again seen in Fig. 3. Referring to gear 27, it is seen in Figs. 2 and 4 as co-acting with a gear wheel 48, and serves to rotate the shaft 49, which is vertical, and upon which, at the lower end, a large wheel 50, is mounted and which is better shown in Fig. 4, while the said shaft is better seen in Figs. 2, and 3. A cross section of the rim of this large wheel 50, is shown in enlarged form at K, Fig. 19. The function of this wheel will be taken up hereinafter, together with other parts not yet mentioned.

Referring again to the shaft 9, and gear 11, Fig. 6, the said gear co-acts with a gear 51, on the shaft 52, which serves to operate a worm screw 53, seen in Fig. 7, and co-acting with the worm wheel 54, operates a shaft 55, upon which are mounted six disk cams, C, D, E, F, H, and I, respectively. Taking up these cams in their order as above, and following the motion of the parts actuated by them, we commence with

cam C, operating a lever 56, Fig. 5, better shown in Fig. 23, where it is shown arranged upon a tubular shaft 57, mounted in a bearing 58, and also carrying another lever 59, which is connected by means of the link 84, to a lever 80, which is integral with slide member 81, Figs. 20, and 21, and which is adapted to slide on its lower surface at or about point 3, and also on the pins 82, shown engaged with the frame work in Fig. 6.

Cam D, Fig. 7, is operably related to a lever 76, Fig. 5, again shown at Fig. 23, and which is mounted on a shaft 77, passing through the tubular shaft 57, and to which is attached another lever 78, while a bearing 79, serves to retain the said shaft in alinement with the tubular shaft 57. The lever 78, is connected to a lever 60, by a link 61 as seen in Fig. 6. This lever 60 is fulcrumed at 62, and is operably connected to the sliding sleeve 63, mounted on the before mentioned semi-hollow shaft 8; a slot 64 is cut through the shaft 8 extending parallel with the sides thereof and communicating with the hollow within said shaft. In said hollow shaft 8 is a slidably arranged pin 65 through which passes a pin 66 carried by the sleeve 63 and working in the slot 64; it will be obvious that these members are thus connected in such a manner that they are permitted to slide together to the extreme limits of the said slot. A link 67, is connected to the lower end of lever 60, at 68, and will be observed again at Fig. 5, where it passes or extends forward to connect with the lever 69, at 70, Fig. 30. The position of lever 69, is suggested in Fig. 4, where the turntable 71, is shown without the said lever.

This lever 69, is fulcrumed on a base 72 Fig. 31, and a sliding sleeve 73, integral with the member 71, is adapted to slide on a base standard 74, and is there operated by that portion of lever 69, shown at 75, in Fig. 30. It will be noted that the lower end of the lever 60, works through a slot 81', shown in the slide 81, in Fig. 6.

The above relative parts, namely, 72, 73, and 74 are not all shown in the assembly although their relative positions are disclosed by the parts 73 and 74 in Fig. 4. The member 72 is not shown therein, and since it is directly above the parts 73 and 74, is omitted in this figure to avoid prolixity of lines in the drawing.

Cam E, in Fig. 7, is adapted to operate lever 85, shown in Figs. 5, 6 and 35, which lever in turn operates a "bell-crank" lever 86, attached to a base 87, on which it is fulcrumed: the said connection being made by the link 88, and a long link 89, serves to connect said "bell-crank" to the lower end of a lever 90, which is fulcrumed on a support 91, at 92 (Fig. 5) the upper end of this lever 90 engaging and operating a sliding

sleeve 93, which is mounted on the aforementioned shaft 21; said sleeve is operably opposed to the beforementioned "lever-fingers" 24. The arrangement shown in dotted lines, outlined thus in Fig. 5, on the link 89, at point 94, discloses a "right" and "left" hand threaded nut, with "jam" nuts included, all of which are adapted for the purpose of adjustment of the distance between the centers of the end connections of the said link 89, and any difference of said distance, obviously must change the resultant travel of the said lever fingers and their pressure on the split ring 23.

Cam F, Fig. 7, is adapted to operate lever 95, Figs. 5, and 6, and in the latter figure a portion of the lever is seen disappearing back of the base 96, and while not again shown, it is adapted by means of its peculiarly shaped extreme end, (as at Fig. 32,) to engage the pin 97, in the vertical rack 98, seen in Fig. 24. This rack operates the gear pinion 99, which is integral with the gear wheel 100, and which in turn operates in connection with the horizontal rack 101, which is integral with the "sound-box" tube 102, to slide the latter along, on and over the inner tube 103 which is supported by the base 96, and as seen terminates in the elbow 105.

Cam H, Fig. 7, is adapted to operate the lever 106, shown in Figs. 5, 6 and 37, and is connected by the link 107, (see Fig. 6,) to the lever 108, Fig. 4, which is again seen in Fig. 27. This lever is mounted on a shaft 109 and sustained by a pair of bearings 110, which are adapted to permit a semi-rotative relation between said shaft and said bearings: another lever 111, is mounted on this same shaft and is adapted to operate a sleeve 112, which is integral with the plate 113, which is adapted to slide upon the base standard 114. The position of the subject matter of Figs. 27, and 28, and in the general *ensemble* of this machine is better shown in Figs. 2, and 4. In Fig. 4 however, the arrangement is shown including the lever 111 only; the base 114 together with the sliding members 112 and 113 are omitted to avoid confusion of lines. The position of these omitted parts however is in the rear of and in alinement with the bank of records shown in Fig. 2, and the relative arrangement of these parts is seen in Fig. 10. Cam I, Fig. 7, is adapted to operate lever 115, seen in Figs. 5, and 6, and which is connected by the link 116, to the lever 117, that is semi-rotatively mounted to fulcrum upon the tube 103, in Fig. 24. This lever is hinged at 118, to permit flexibility, possibly required, and has a roller 119, mounted in one end thereof, and which is adapted to sustain a rod 120, having a rolling contact therewith, said rod being mounted at one end in the lever 121; the lever 121 is inte-



gral with the "sound box" tube 102, connecting thereto at or about the point 102' shown in Fig. 24. A study of this mechanism must make it appear obvious that the said "soundbox" will remain in the position shown, until the said levers are moved, which will cause the said "sound box," and tube to move semi-rotatively around the said tube 103, independent of their, then horizontal, location upon the said tube 103. Inasmuch as none of the cams are positive both ways, in their action, but are only permissive in the return of their respective levers, it may be desirable to employ spiral springs 203, suitably arranged to exert pressure on the said levers to keep them in working contact with their respective cams at all times. In Figs. 8, 9, and 10, are shown details in the first two and assembly in the latter, of a bank consisting of a series of disk records, mounted edgewise and inclined somewhat from the perpendicular, in a system of carrying chains. The records 122, rest in, on and between these chains 123, 124, and 125, occupying recesses in the links thereof, shown at 126, and more fully shown in Fig. 11. The three chains run on octagonal sprocket wheels which are all geared together by means of wheels 127, 128, shaft 129, and wheels 130, 131, and tumble-joint 132, in such a manner as to preserve the same relative positions of certain links in each of the said chains at all times. The motion is retarded by the eight point ratchet wheel 133, together with the detent spring 134, Fig. 8, and which is shown enlarged in Fig. 29. The point of actual retardance, being shown in the position of parts in Fig. 10, which is at a time when a record has just been discharged from the chains to a position as seen at 135, where the upper edge of the said record rests against the stop post 136. The remainder of this record motion will be taken up in the description of the general action of the machine.

Referring to Fig. 2, we will trace the lower track 137, which is shaped as in Fig. 18, at the point 138; this member shown in Fig. 18, is introduced as member 139, in Fig. 2, and is the commencement of the aforementioned track 137, which extends along horizontally until it describes a depression, as at 140, and thence along until it ends at 137', which is a point, that, were a line drawn from the center of the shaft 49, to the end of said track, at this point, then the included angle between that line and the general line of the said track, would approximate 92 or 93°. Another track, suggested at 141, commences directly opposite track end 137', and unlike its companion it ascends as it advances back to the record chains, as will be seen at 141'. These two tracks are arranged so that they end as described, directly over a similar grooved

track way in the rim of the wheel 50, which is seen to better advantage, in enlarged section in Fig. 19. The commencement of the front track, (embodied in the member 139,) is placed in position in such a manner that the groove in same will lie directly below the point, described by the perpendicular dotted line 141'', in Fig. 10, and the lip of same at 142, Fig. 18, being concave and describing the same curvature as the edge of the records and inclined in its introduction thereunder, (suggested by the short dotted line 143, Fig. 10,) serves as a conveyance for the lower edge of the record, into the track, to which point it slides. The terminus of the track 141, and 141', is directly opposite and near enough to the recess in the chain, shown at 144, Fig. 10, so that a record may roll and transfer from the former to the latter.

Referring to Figs. 3, and 4, we will trace the elevated tracks, which are companions to those last described, and as in Fig. 3, the commencement of same is at 145, and it is sustained, in its elevated position by a pair of guide track brackets 146, one of these brackets being adapted to each end of the said track respectively, and a combination wheel bracket 41' (which is constructed like the brackets 34') is attached to said track centrally between the brackets 146, completing this track. The terminus of this track is shown at a point nearly under the wheel 42, and comparison with Fig. 4, will disclose the relative position of the said terminus, with respect to the turn-table 71, and the disk 7, between which a record must pass after leaving the track. The hereinbefore mentioned depression 140, in the lower track, is directly below this disk and turn-table, and therein the record settles for a time. Another track, sustained by brackets similar to the brackets 146, and shown at 148, Fig. 3, terminates as shown at 148', in Figs. 3, and 4, in such a manner that the commencement of the elevated semi-circular track 149, as seen in Fig. 4, is in substantial alinement therewith and is adapted to act as a continuation thereof. Said track 149, is held in position by means of the brackets 150, and describes the same curve as that described by the grooved track in the rim of the wheel 50, and being directly above same, it terminates at 151. This point is in juxtaposition with the commencement of the rear elevated track and from this point, the said rear elevated track continues along, inclined upward, parallel with the track under it and it is sustained, in like manner to the front tracks as described, by means of brackets 34', within which the idle wheels 34, are mounted, and to which the said track is attached, as shown at 152, Fig. 16. When reaching the point 153, Fig. 4, this last named elevated track is diverted from

its original direction of path and from there on it leads over until reaching its terminus at the point 154, (which as shown, is still under the belt wheel 35,) but this "lead" is sufficient, so that when a record leaves the said track and the terminus of the lower track, as described, the said record will have an inclination from the true vertical, sufficient to cause it to enter, (not only the recess in the chain, designated at 144, Fig. 10,) but also the one above, at 155. Two records may be observed, shown in their respective positions, controlled by these said tracks, in Fig. 3, and it may be seen how the edge of the record extends above the upper track, to a point, where it may be engaged by the felt belt hereinbefore mentioned.

In describing one complete operation of this machine, reference being had to Fig. 2, all parts as seen therein are in a position as assumed by each, respectively, at a time, just before a record leaves the carrying chains to advance to a playing position. At this period of the operation, a record will be leaning against the post 136 as in Fig. 10, and the bottom edge of the record will be moving from the lower chains to the semi-circular lip 142, serving to guide the bottom of the record, which slides on the lip onto the track, and advancing in settling therein, the record moves until the top edge of same is engaged by the felt belt which is running on the wheel 40. It may be stated here, that the record really enters the track at point 145, at the same time it engages the said belt. This is due to the natural curvature of the edge of the record. The record is now traversed along the tracks by means of the belt engaging the top of the record and which rolls it to, and from, the end of the elevated track, where it, the said record, is discharged and the record is now between the turn-table 71, and the revolving disk 7, Fig. 4. The record has now settled in the depression in the lower track at 140, Fig. 2, and immediately thereafter the cam D, operates the lever 60, and through its respective communicating parts, it operates the sleeve 63, and the pin 65, thereby thrusting the said pin out to approximately the position of same, assumed in Fig. 6. The said record is in a position now, where the said pin 65, may engage the hole in the center of the record and in so doing, it passes through the record. The said record is thus forced to centralize on the pin and this raises it a small distance, (or to be exact, some less than one half of the diameter of the said hole,) and entirely out of the said depression 140 in the track.

The turn-table is automatically brought to contact with the record at one and the same time as the pin advances, by means of

the bottom connection of the said lever 60, and its intermediate link 67, connecting to the turn-table lever 69, disclosed in Fig. 31. The record is now revolving at the playing speed, which is 78 R. P. M. for the reason that the shaft 8, is caused to so rotate by a suitable motive power, electricity preferred, the source of which is not shown in any of the drawings. Immediately after the said record is so clamped in rotative position, the cam I, operates through its intermediate connections and the lever 117, and relative parts, to lower the sound-box and to bring the stylus, onto the record, assuming the position as seen in Fig. 6. Immediately after this action, the cam E, operates through intermediate connections, to release the clutch on the shaft 21, and the record traversing mechanism comes to a halt. At this period of the operation the cam F, actuates the lever 95, which operates the double rack and pinion movement shown in Figs. 24, and 6, and as hereinbefore described, the motion is adapted to traverse the said sound-box across the face of the record and on its recorded surface, and in such a manner, the cam F, being so shaped that its motion graduates the travel of the sound-box in a positive manner so that the stylus of same, freely "tracks" on the record without dragging. The return of the movement of these parts back to the normal starting position is permitted by the cam and is actuated by the spring member on the lever 95. The average number of convolutions in a record spiral track, taken from a large number of records has been found to be about 220 and I have timed the several motions of this mechanism in a manner so that in one complete operation of the machine the cam shaft 55, makes but one revolution in that time and the record shaft 8, makes 300 revolutions; which, if the 220 revolutions necessary to play the record, be subtracted, it will leave a remainder of 80 revolutions that the said shaft 8, must make, during which time the said records are changed. After the record has been nearly played, the cam C, operates to fill the depression in the lower track by means of the slide member 81, Figs. 21, and 6, through the intermediate connections between said member and the cam actuated lever 56. Thereafter, about this period, the record having been played, the cam E, operates to reengage the clutch on shaft 21, and the belt mechanism is caused to commence to operate. The cam I, operates to lift the sound-box stylus from off of the record and the cams D, and F, operate simultaneously to release the record by withdrawing the pin 65, and removing the turn-table 71, returning the sound-box back to its normal starting position, respectively. The record as it is released from the pin, is revolving at 78 R. P. M. and



falling edgewise, still reasonably confined by the revolving disk and the turn-table, in a vertical position, it gets an impulse forward when it comes in contact with the member 81, heretofore introduced and as the contact surface of this said member is flush with the continuation of the lower track, the record moves forward in the direction it is then revolving and immediately enters the second elevated guide track under the wheel 43, Fig. 3, and is engaged by the belt running thereon. By this belt it is traversed forward to where it is discharged from the belt and track, and dropping onto the rim track of the wheel 50, it enters the semi-circular track above and is carried around the said wheel, approximately one-half of the whole circumference of said wheel, to a point where the said record comes under the belt on the flexible shaft and pulley 32. The record reaches the end of the semi-circular track, while well under the last named belt, and as it obviously must roll up from off of the wheel 50, onto the rear lower track, the flexible shaft compensates for the said raise and consequent displacement of the belt upward. The record is then rolled to the chains by the third felt belt in the system, and is delivered into its respective notches in the said chains, as hereinbefore described, and immediately thereafter, the cam H, operates the lever 106, and the intermediate connections 107, 108, 109, and 111 are operated and thus actuate the thrust-plate 113, shown in Fig. 28, which is also seen in Fig. 10. The said plate 113 coming in contact with the last record just introduced into the chain's notches, causes the whole system of chains and records to advance a predetermined distance, or a space equal to the distance between one notch the next adjacent one in the chains, the ratchet wheel 133, acting as a retainer for this mechanism in this last named position and preventing it from running beyond. This action having been produced, the cam H, returns the thrust-disk back to its normal starting position and we have returned now to a point in the action of this whole mechanism that is identical with the point where we took up the description of the general operation.

It will be noticed that the whole body of records come forward in the chains, presenting the same "face" respectively, that was nearest the record preceding it, when they, the records respectively, entered the series in the rear. And, also, as the record is played, discharged and carried around to the series chains again, it has been turned, face about, as a natural consequence of the manner of operation of the mechanism employed, and it now presents the opposite face to its preceding companion than that which it last presented upon entering the

series and thus the record is turned, and every time a record is presented to be played it presents the opposite face for that purpose, than that which was last played. Thus a bank of 50 records will afford a selection of 100 different titles, or selections.

The paramount important feature of this machine, is that it is adapted to play the popular double-faced record of commerce and automatically handle a large number of same in a comparatively small space, turning the same so as to alternately play the selection on each side thereof respectively.

In the drawings of this machine, I have not laid any stress upon the horn connections, merely showing the horn from the sound box in Fig. 2, as opening out in the open air, at 200, and the details of same beyond that point are the subject of another application, as well as the details of the particular sound-box which I purpose using; the sound-box shown is of ordinary form, merely adopted here to enable me to illustratively connect the several parts in the drawings as shown.

Having thus described my invention clearly and in conformity with the disclosure in the drawings, so that those who are skilled in the art to which the invention appertains, may make and use same, what I claim and wish to secure by Letters Patent is—

1. In an automatic graphophone, the combination with a suitably-mounted bank of records, of means for automatically displacing the records successively from the bank, means for conducting each record as displaced to playing position, a sound reproducer mechanism, means for causing the sound reproducer to traverse the records while the latter are in playing position, and means for removing the records from playing position and returning them to the bank of records with their faces reversed.

2. In an automatic graphophone, the combination with a carrier for disk-records, a bank of disk records mounted therein in substantially vertical position, means for successively displacing the records and conducting them in vertical position to the point for playing, means for positioning the records in playing position, a sound reproducer, means for causing the sound reproducer to traverse the records while the latter are in playing position, means for removing the records from playing position and returning same to the carrier with their faces reversed from that occupied when displaced from said carrier, and means for intermittently advancing the carrier.

3. A mechanism for automatically-playing graphophone records of the double-faced disk type, comprising in combination, an intermittently-movable record carrier, a bank of records mounted edge-wise there-

in to be successively displaced therefrom, a sound reproducer, means for conducting each record as displaced from the carrier into position with relation to the sound reproducer, and means for automatically displacing the record after it is played and returning it to the bank of records with its reverse face presented in the direction of the carrier travel from that it occupied when displaced from said carrier.

4. In mechanism for automatically-playing records of the double-faced disk type, the combination with an intermittently-movable record carrier, and a bank of records mounted edgewise therein to be successively displaced therefrom, of means for operating the carrier intermittently to successively displace the records, a sound reproducer, means for automatically conducting the records from their carrier-displaced position to playing position with respect to the sound reproducer, means for causing the sound reproducer to traverse the records while the latter are in playing position, means for removing the records from playing position, and means for turning the records and returning same to the opposite end of the bank of records in the carrier, said records throughout their travel and while in playing position being maintained in the edgewise position.

5. In mechanism for automatically-playing graphophone records of the double-faced disk type in a vertical position, the combination with an intermittently movable record carrier, and a bank of records mounted edge-wise therein, of a sound reproducer, means for conducting the records in vertical position from the carrier to playing position with relation to the sound reproducer, means for causing the sound reproducer to traverse the records while the latter are in playing position, and means for reversing the records after their removal from playing position and returning the same to the carrier with their faces reversed from that which they occupied when displaced therefrom.

6. In mechanism for automatically playing graphophone records of the disk type in a vertical position, the combination with an intermittently-movable record carrier, a bank of records mounted edge-wise therein, a sound reproducer, means for automatically displacing said records from the carrier, said means utilizing the bank of records to effect displacement, and means conducting said records in a vertical position to playing position with respect to the sound reproducer, and means for returning the records automatically from playing position to the carrier with the records in a vertical position.

7. In mechanism for automatically playing graphophone records of the disk type

in a vertical position, the combination with a record carrier, and a record mounted edgewise in said carrier, of a sound reproducer, means for conducting the record from the carrier to playing position while maintaining the record in a vertical position, means for causing the sound reproducer to traverse the record with the latter in vertical position, and means for returning the record automatically to the carrier, the record throughout its travel and while in playing position being maintained in vertical position.

8. In mechanism for automatically playing graphophone records of the disk type, the combination with a sound reproducer, of means for conducting a record from non-playing to playing position with relation to the sound reproducer while maintaining the record in a vertical position, means for causing the sound reproducer to traverse the record while the latter is in vertical position, and means for maintaining the record in vertical position after it is displaced from playing position and is being returned to non-playing position.

9. In mechanism for automatically-playing graphophone records of the double faced disk type, the combination with a bank of records mounted edgewise, of a sound reproducer, means for conducting the records successively from the bank to the reproducer in vertical position, means for causing the sound reproducer to traverse the records while the latter are in playing position, and means for reversing the records after their removal from playing position while returning the same to non-playing position in the bank.

10. In mechanism for automatically playing graphophone records of the double-faced disk type, the combination with a bank of records, and a sound reproducer, of means for conducting the records successively from the bank in vertical position to the reproducer, and means for turning and returning the records to the bank with their faces reversed from that in which they were removed therefrom.

11. In mechanism for automatically playing graphophone records of the double faced disk type while in the vertical position, the combination of a bank of records mounted edgewise, a sound reproducer, means for conducting the records from the bank into playing position with relation to the reproducer while maintaining the records in vertical position, means for reversing the records after their removal from playing position, and means for returning the records to the bank while maintaining the records in a vertical position.

12. In mechanism for automatically playing graphophone records of the disk type with the records in a vertical position, the



combination with a bank of records, and a sound reproducer, of means for conducting the records from the bank to the reproducer while maintaining the records in vertical position, and means for causing the sound

5 reproducer to traverse the records while the latter are held vertically in playing position.

10 13. In mechanism for automatically playing graphophone records of the disk type with the records in vertical position, a record carrier, and a bank of disk records mounted edgewise therein, a sound reproducer, means for successively conducting

15 records from the bank to the reproducer and maintaining the same in a vertical position, means for causing the reproducer to traverse the records while the latter are held in vertical position, and means for returning the records to the carrier.

20 14. In mechanism for automatically playing graphophone records of the disk type with the records in vertical position, the combination with a record carrier, and a

25 bank of records mounted edgewise therein, of a sound reproducer, means for conducting the records from the carrier to the reproducer while maintaining the same in vertical position, and means including a

30 cam for causing the reproducer to traverse the records while the latter are positioned vertically in playing position with relation to the reproducer.

35 15. In mechanism for automatically playing graphophone records of the disk type, the combination with a record carrier, a record mounted edgewise therein and a sound reproducer, of means for conducting the record from the carrier to the repro-

40 ducer while maintaining the record in a vertical position, and means for causing the sound reproducer to traverse the record while the latter is held vertically in playing position.

45 16. In mechanism for automatically playing graphophone records of the disk type while the latter are held in vertical position, the combination of a record carrier, a record mounted edgewise therein, a sound

50 reproducer, means for conducting the record from the carrier to the reproducer while maintaining such record in vertical position, and means including a cam for causing the reproducer to traverse the record while

55 the latter is vertically positioned in playing position.

60 17. In mechanism for automatically playing graphophone records of the disk type and having a record on each face thereof, the combination with an intermittently-movable record carrier, a bank of records disposed edgewise in said carrier, a sound reproducer, means for conducting the records in vertical position from the carrier to

65 the reproducer, means for causing the re-

producer to traverse the records while the latter are in vertically-disposed playing position with respect to the reproducer, means for turning the records after displacement from playing position, and means for returning the records to the carrier in their

70 turned position, the records throughout their travel being maintained in vertical position.

75 18. In mechanism for automatically playing graphophone records of the disk type, the combination with a record carrier, and a bank of records edgewise positioned therein, of means for intermittently moving the carrier, a sound reproducer, means for conducting

80 records from the carrier to the sound reproducer, means for causing the sound reproducer to traverse the records with the latter are vertically disposed in playing position with relation to the reproducer, and

85 means for returning the records to the bank with their reverse faces presented in the direction of travel of the carrier.

90 19. In mechanism for automatically playing graphophone records of the double-faced disk type, the combination with a bank of records disposed edgewise, a sound reproducer, means for conducting the records from the bank and positioning the same vertically with respect to the sound reproducer,

95 means for causing the reproducer to traverse the records while the latter are held vertically, and means for returning the records to the bank with their faces reversed from that in which they are removed therefrom.

100

20. In mechanism for automatically playing graphophone records, the combination with a bank of records disposed edgewise, a sound reproducer, means for displacing the records from the bank and arranging same

105 vertically in playing position with respect to the reproducer, and means for returning the records with their faces reversed in the bank from that they occupied when displaced therefrom.

110

21. In a mechanism for automatically playing graphophone records of the disk type, a sound reproducer, means for automatically placing a record vertically in playing position with relation to the repro-

115 ducer, and means including a disk-cam for causing the reproducer to traverse said record.

22. In a mechanism for automatically playing graphophone records of the double-faced disk type, a record carrier, a disk record mounted edgewise therein, a sound reproducer, means for conducting the record from the carrier to the reproducer while maintaining the record in a vertical position,

120 means for causing the sound reproducer to traverse the record while the latter is held vertically in playing position, and means for automatically turning and returning the record to the carrier with its faces reversed

125

130

from that in which it was removed therefrom.

23. In a mechanism for automatically playing graphophone records of the double-faced disk type, a record carrier, a record mounted therein, a sound reproducer, and means for conducting the record from the carrier to the sound reproducer and for automatically positioning the opposite faces of the record in playing position with respect to the sound reproducer.

24. In a mechanism for automatically playing graphophone records of the double-faced disk type, a record carrier, a bank of records mounted therein, a sound reproducer, mechanically-operated record-engaging means acting when operated to move the record in the bank, means for conducting said record to playing position with respect to the sound reproducer, and means for turning said record and returning it to the opposite end of the bank from that from which it was removed to present the reverse face of the record toward the removal end of the bank.

25. In a machine for automatically playing

graphophone records of the double-faced disk type, a record carrier, a bank of records mounted edgewise therein, a sound reproducer, mechanically-operated record-engaging means acting when operated to move the bank of records and displace the foremost record in the bank, means for conducting said record while maintaining the same vertically to playing position with respect to the sound reproducer, and means for turning said record and returning the same to the bank at the opposite end thereof from that from which it was removed to present the reverse face of the record toward the removal end of the bank, said means maintaining the record in vertical position during the turning and returning thereof to the bank.

In witness whereof I have signed this specification in the presence of two subscribing witnesses this 24th day of February, A. D. 1911.

JAMES I. GEMMILL.

Witnesses:

F. E. WOLFE,  
G. J. WOLFE.



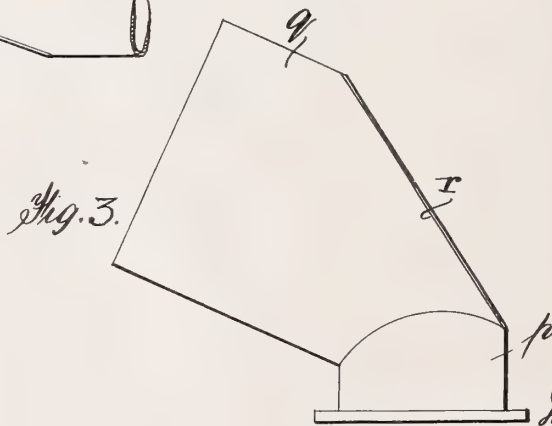
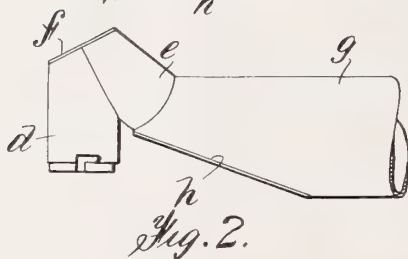
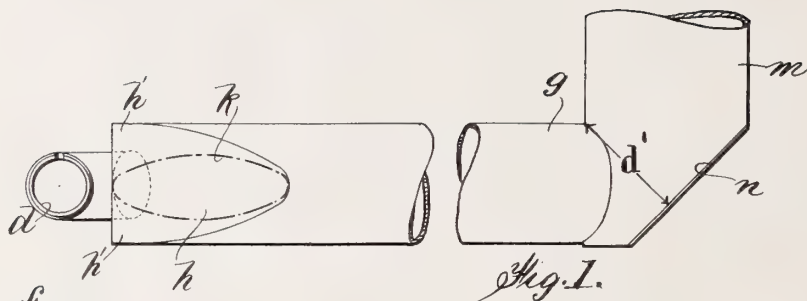




A. FISCHER.  
SOUND CONDUIT OR AMPLIFYING DEVICE FOR TALKING MACHINES AND THE LIKE.  
APPLICATION FILED APR. 16, 1910.

1,029,002.

Patented June 11, 1912.



*Witness:*  
*J. S. Gusto*  
B. H. D. Bailey

*Inventor:*  
A. Fischer  
by *Wickham, Fisher & Witherspoon*  
his attorneys.

# UNITED STATES PATENT OFFICE.

ALEX FISCHER, OF WEST KENSINGTON, LONDON, ENGLAND.

SOUND-CONDUIT OR AMPLIFYING DEVICE FOR TALKING-MACHINES AND THE LIKE.

1,029,002.

Specification of Letters Patent.

Patented June 11, 1912.

Application filed April 16, 1910. Serial No. 555,776.

*To all whom it may concern:*

Be it known that I, ALEX FISCHER, a subject of the King of England, residing at 8 Maelise road, West Kensington, in the county of London, England, have invented certain new and useful Improvements in and Relating to Sound-Conduits or Amplifying Devices for Talking-Machines and the Like; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to sound conduits applicable to talking machines and the like in which one or more bends are formed for the purpose of directing the sound waves in the desired direction, and the object of my invention is to so form the bends that the sound waves may be passed through the conduit in straight lines without being compressed, intermingled or diffused and without being deflected against the side walls of the conduit.

In carrying out my invention each joint or bend in the conduit is provided with a reflecting surface which is inclined equally to the axes of both parts of the conduit on opposite sides of the bend so that the sound waves are reflected in straight lines parallel with the axis of the conduit. The cross sectional area of the conduit in the narrowest part of the bend is approximately the same as the cross sectional area of that part of the conduit from which the reflector receives the sound waves whereby such waves are transmitted without compression or diffusion. The reflecting surface is of such size as to receive all of the waves and directly transmit all of them to the next part of the conduit. The cross sectional area of the conduit at the narrowest part of the bend is approximately the same as the cross sectional area of that part of the conduit whence the sound waves proceed. The section of the conduit will in most cases consequently and relatively increase in size from the receiving to the discharge end in order to obtain the advantages above specified. By the construction explained, sound waves are transmitted without compression, deflection or diffusion, and these waves are discharged from the conduit with full volume of clear tone and of good quality.

In the accompanying drawings, Figure 1 shows a side elevation of a sound conduit

with several bends made in accordance with my invention, such conduit being in this instance of suitable construction for the tone arm of a talking machine. Fig. 2 is a plan view of part of the conduit shown in Fig. 1. Fig. 3 shows an elbow joint suitable for connecting a tone arm with a trumpet.

The tube *d* is adapted to connect with a sound box of a talking machine and it joins a tube *e* which is arranged at an angle to the tube *d*. As shown, the axes of the two tubes are at an acute angle to each other. *f* is a reflecting surface between the two tubes. The tube *e* joins a tube *g* of larger diameter and at *h* is a reflecting surface which receives sound waves from the tube *e* and transmits them through the tube *g*.

In Fig. 1 the outlines of the projected surface, *i. e.* the surface upon which the sound waves passing from the tube *e* impinge, is shown by the dotted line *k*. This surface, while of sufficient size to receive all of the reflected waves, forms in this case a portion only of the larger surface opposite the tube *e*, the corners *h'* being left on the tube *g* to cheapen construction. The tube *g* is connected with a tube *m* of larger diameter and at right angles to the tube *g*, the reflecting surface *n* being set therefore at an angle of 45° to the axis of each of the tubes.

Referring to Fig. 3 the part *p* is adapted to connect with the part *m* in Fig. 1, and this part *p* connects with a part *q* of larger diameter, there being a reflecting surface *r* which receives all the sound waves passing out through *p* and transmits them through the part *q*. In each case the diameter of the two parts of the conduit on opposite sides of any joint or bend are of such relative size and the reflecting surface is of such proportions that the free space at the narrowest place between the angle of the bend and the reflector is about equal to the diameter of the smaller part of the conduit, *i. e.*, the part from which the sound waves pass on their way to the bend. For instance, as shown in Fig. 1, the part of the conduit indicated at *d'* is of the same or approximately the same cross sectional area as the part at *g*, and in all cases the construction is such that the sound waves, while being reflected in straight lines from one part of the conduit to the other, are never deflected in zig-zag lines against the side walls of the conduit, are never compressed by being passed through restricted parts thereof, nor



is the conduit so enlarged at the angles of the bends as to diffuse the sound waves unduly while they are having their directions changed by the reflectors.

5 It will be understood that the invention is applicable generally to sound conduits having a bend or bends or meeting at an angle, but in all cases the construction must be such that the smallest area at the bend,  
10 bounded by the tubes and the reflector, is about equal to the sectional area of the tube from which the sound is proceeding.

I claim as my invention:—

15 1. A sound conducting pipe, having a bend provided with a plane or flat reflecting surface inclined equally to the axes of both parts of the pipe on opposite sides of the bend so that the sound waves are reflected  
20 in straight lines parallel with the axis of the pipe, the free space or cross sectional area at the narrowest place between the angle of the bend and the reflector being approximately equal to the cross sectional  
25 area of that part of the pipe from which the sound waves pass on their way to the bend.

2. A sound conducting pipe, having a bend provided with a plane or flat reflecting  
30 surface inclined equally to the axes of both parts of the pipe on opposite sides of the bend so that the sound waves are reflected in straight lines parallel with the axis of the pipe, the parts of the pipe on opposite  
35 sides of the bend being of different diameters and the free space or cross sectional area at the narrowest place between the angle of the bend and the reflector being approximately equal to the diameter or cross sectional  
40 area of the smaller part of the pipe from which the sound waves pass on their way to the bend and such reflecting surface

being of such dimensions as to receive all of the projected area from that part of the pipe from which the sound waves proceed.

3. A sound conducting pipe having a plu- 45  
rality of bends each of which bends is provided with a plane or flat reflecting surface inclined equally to the axes of both parts of the pipe on opposite sides of the bend so that the sound waves are reflected in straight  
50 lines parallel with the axis of the pipe, the free space or cross sectional area at the narrowest place between the angle of the bend and the reflector being approximately equal to the cross sectional area of that part of the  
55 pipe from which the sound waves pass on their way to the bend.

4. A sound conducting pipe having a plu-  
rality of bends, each bend being provided with a plane or flat reflecting surface in- 60  
clined equally to the axes of both parts of the pipe on opposite sides of the bend so that the sound waves are reflected in straight lines parallel with the axis of the pipe, the parts of the pipe on opposite sides of the  
65 bend being of different diameters and the free space or cross sectional area at the narrowest place between the angle of the bend and the reflector being approximately equal to the diameter or cross sectional area of  
70 the smaller part of the pipe from which the sound waves pass on their way to the bend, and such reflecting surface being of such dimensions as to receive all of the projected  
75 area from that part of the pipe from which the sound waves proceed.

In testimony whereof, I affix my signature, in presence of two witnesses.

ALEX FISCHER.

Witnesses:

A. E. VIDAL,  
L. SIMIND.



S. W. WYLIE.  
 PHONOGRAPHIC RECORDING AND REPRODUCING DEVICE.  
 APPLICATION FILED MAR. 6, 1911.

1,029,249.

Patented June 11, 1912.

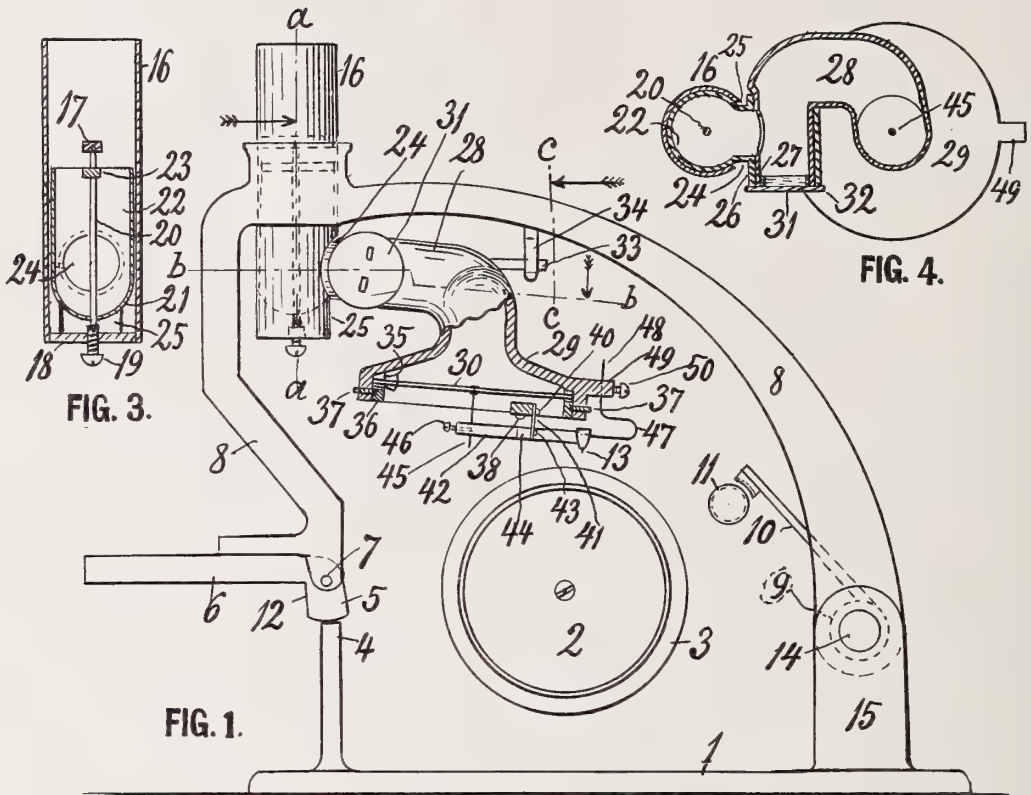


FIG. 3.

FIG. 4.

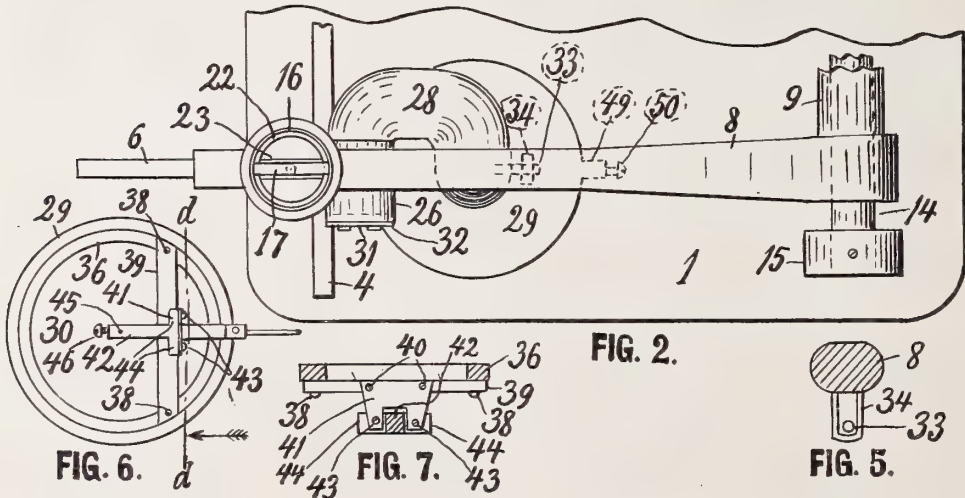


FIG. 6.

FIG. 2.

FIG. 7.

FIG. 5.

WITNESSES:

Mabel Carlson.

A. C. Carlson.

INVENTOR  
 Samuel W. Wylie.  
 BY his ATTORNEY,  
 A. M. Carlson.



# UNITED STATES PATENT OFFICE.

SAMUEL W. WYLIE, OF JAMESTOWN, NORTH DAKOTA.

PHONOGRAPHIC RECORDING AND REPRODUCING DEVICE.

1,029,249.

Specification of Letters Patent.

Patented June 11, 1912.

Application filed March 6, 1911. Serial No. 612,573.

*To all whom it may concern:*

Be it known that I, SAMUEL W. WYLIE, a citizen of the United States, residing at Jamestown, in the county of Stutsman and State of North Dakota, have invented a new and useful Phonographic Recording and Reproducing Device, of which the following is a specification.

My invention relates to phonographic devices for recording and reproducing sounds; and as the mechanism and principles of the invention are applicable to both recording and reproducing devices, I will describe it mainly as a reproducing device.

The main object is to provide a device that will record and reproduce sounds with more volume, clearness and exactness than the devices heretofore provided. To attain this object I, first, dispense with all moving weights or bodies, like pistons, pressure weights, balance weights &c., in connection with the stylus lever and diaphragm, as the momentum of weights in that connection tends to disturb and often resist the proper vibration of the stylus. Second, I provide means whereby the diaphragm is normally held in plane position when the stylus is in contact with the record, so that the diaphragm may vibrate with ease to either side of its plane position, while in ordinary phonographs the contact of the stylus with the record causes the diaphragm to stand in a bulging position, from which it is only partly sprung back by the vibratory effect of either the sound waves on the record or the sound that should produce such waves on the record; and it is evident that such imperfect vibrations can only produce imperfect results. Third, I provide a very delicate or sensitive joint by which to permit the stylus to follow the middle of the spiral groove of the record, thus avoiding the effect of a tendency of the stylus to climb up the sides of the spiral groove. Fourth, I provide means for the prevention of all lost motion between the stylus, the diaphragm and the record.

In the accompanying drawing,—Figure 1 is a partly sectional end elevation of the upper portion of a phonograph with my improvements applied to it. Fig. 2 is a top view of the portion shown in Fig. 1 with the feed screw, feeder arm, record and record mandrel omitted. Fig. 3 is a section near the line *a—*a** Fig. 1. Fig. 4 is a section on

the line *b—*b** Fig. 1, with the recorder arm omitted. Fig. 5 is a section on the line *c—*c** Fig. 1. Fig. 6 is a bottom view of the diaphragm casing and stylus lever and its connection. Fig. 7 is a section on the line *d—*d** Fig. 6 with the casing proper omitted.

Referring to the drawing by reference numerals, 1 designates the usual metal frame upon which the reproducing mechanism is mounted, 2 is the mandrel in the usual position with a record 3 on it. Upon a guiding rib 4 rests the cam 5 of a cam-lever 6, which is pivoted at 7 to the front end of the curved reproducer arm 8, whose rear end is fixed on a sleeve 9, which carries an arm 10 adapted to engage in the threads of a feed screw 11 when the lever 6 is swung downward with its notch 12 upon the rib 4, so as to bring the stylus 13 into contact with the record. The sleeve 9 slides on a rod 14, whose ends are secured in two posts 15, of which only one is shown. In the top of the reproducer arm 8 is fixed a tube 16, whose upper end is designed to receive the small end of the horn of the phonograph, (not shown). In said tube are fixed two diametrical bars 17 and 18, the former quite high up and the latter in the lower end of the tube, (as best shown in Fig. 3). In a central cavity in said upper bar, and in a cavity in the point of a screw 19 in the lower bar are sensitively journaled the pointed ends of light shaft 20, on which is centrally fixed, to rotate freely within the tube 16, the bottom 21 of a shorter tube 22, in whose upper end is a diametrical bar 23, also secured, or at least guided on the shaft. Said tube 22 is provided with a lateral hollow arm or neck 24, which is inserted upward into a gap 25 in the tube 16, and will play laterally in the upper part of the gap sufficiently to permit the stylus lever to occupy a transverse position to the mandrel that carries the records. The outer or rear end of the neck 24 is provided with a transverse tubular head 26 (see Figs. 2 and 4); in which is loosely journaled the end portion 27 of a curved tubular arm 28, whose rear end carries the casing 29, in which the diaphragm 30 is arranged. The arm portion 27 is closed and retained in its place by a cap 31, screw-threaded into the end of the arm and having a rim or flange 32 bearing loosely against the end of the tube 26. The casing 29 is provided with an arm 33, playing in a stirrup 34 on the arm 8 when the machine



is in operation, and is supported in said stirrup when the arm 8 is raised out of operation by the lever 6.

The diaphragm 30 may be made of any suitable material and is preferably normally plane, except that it may have circular corrugations. The edges of it may be held between soft rings 35, which together with the diaphragm are held in place by a metal ring 36, which may be either threaded into the casing or held therein by screws 37.

Integral with the ring 36, or secured thereto by screws 38, is a supporting bar 39, to which is secured by screws 40 a thin spring metal hanger or leaf 41, whose lower end is formed with two legs, which straddle the stylus lever 42 and are secured by screws 43 to short side arms 44 of said lever. From the center of the diaphragm extends downwardly a light springy metal rod 45, whose lower end is adjustably held in the adjacent end of the stylus lever by a screw 46. The other end of the lever carries the stylus 13, and has affixed to it one end of a preferably loop-shaped spring 47, of which the upper end 48 is inserted in a short arm 49 on the casing 29 and is there adjustably secured by a screw 50.

The operation of the device has been partly stated in the beginning of this specification, but it may be further stated that as long as the stylus is held idle away from the record 3, the spring 47 holds the stylus downward and the diaphragm bulged upward by the connection wire 46, and when the arm 8 is lowered so that the stylus gets into proper contact with the record, the weight of the casing 29 and the parts carried by it bends the spring 47, which spring has its tension previously regulated by the screw 50, until the diaphragm stands in a plane position, and as the record rotates and the stylus is vibrated up and down by the sound-producing waves or indentures of the record, the diaphragm is thereby easily vibrated more or less above and below its slackest point or plane position; and as the connections 41 and 46 are without pivots or other joints, there is no loss of motion, but the entire motion of the stylus, and also such increase thereof as may be secured by arranging the hanger 41 more or less away from the middle of the stylus lever toward the stylus, will be transmitted to the diaphragm.

From the above description it will be un-

derstood that the main new elements and features of the invention will produce a very efficient reproducer, and also that when said parts and features are applied to a recording device, the latter will be of increased efficiency to produce an improved record; and that such record when operating my improved reproducer will give the nearest possible correct reproduction of the original sounds.

What I claim is:—

1. In a phonographic recording or reproducing device, the combination with a casing having at one end a lug and at its base a horizontal bar, a diaphragm secured in the casing, a stylus lever fulcrumed intermediate its ends to the horizontal bar, a rod connecting one end of said lever with the middle of the diaphragm, a stylus in the other end of the lever, and a spring connecting the stylus end of the lever with the lug on the casing and acting on the lever to maintain the diaphragm in a substantially plane position when the stylus is engaged with the recording or record surface.

2. In a phonographic recording or reproducing device, the combination with a casing having at one end a lug and at the base a horizontal bar, a diaphragm secured in the casing, a stylus lever fulcrumed intermediate its ends to the horizontal bar, a rod connecting one end of said lever with the middle of the diaphragm, a stylus in the other end of the lever, and a spring connecting the stylus end of the lever with the lug on the casing and acting on the lever to maintain the diaphragm in a substantially plane position when the stylus is engaged with the recording or record surface; and means at the lug for changing the tension of the spring.

3. The combination with a sound box or casing and a diaphragm secured therein, of a stylus lever having one end connected with the diaphragm and the other or stylus end of the lever provided with a bow-shaped spring having at one end an arm, said casing having at one edge a lug with a hole receiving said arm, and a set-screw holding the arm adjustably in the hole.

In testimony whereof I affix my signature, in presence of two witnesses.

SAMUEL W. WYLIE.

Witnesses:

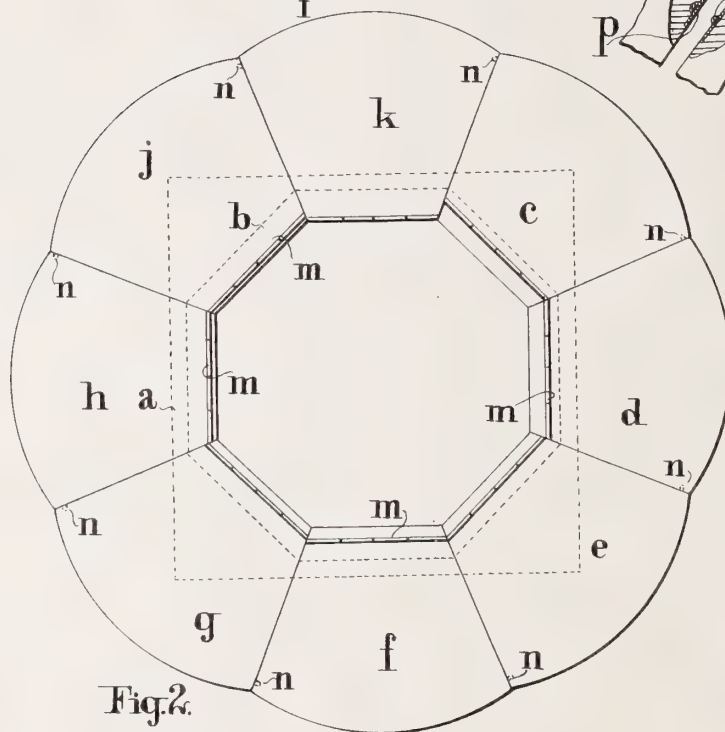
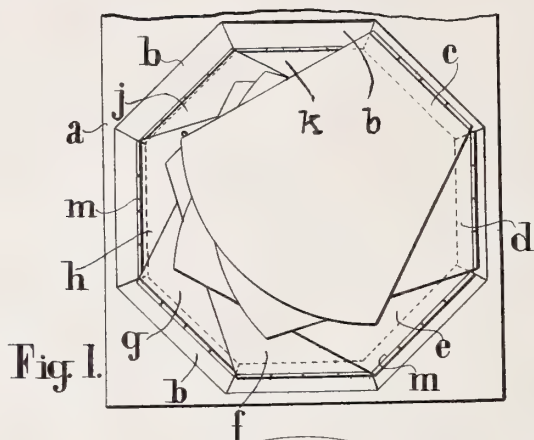
A. L. KNAUF,  
J. E. MCGREGOR.



1,029,502.

J. M. LANDON.  
TRUMPET.  
APPLICATION FILED MAR. 11, 1910.

Patented June 11, 1912.  
2 SHEETS—SHEET 1.



Witnesses:  
J. S. Quarta  
B. B. Collings.

Inventor:  
J. M. Landon  
by William Fisher & Witherston  
his attorneys.





J. M. LANDON.

TRUMPET.

APPLICATION FILED MAR. 11, 1910.

Patented June 11, 1912.

2 SHEETS-SHEET 2.

1,029,502.

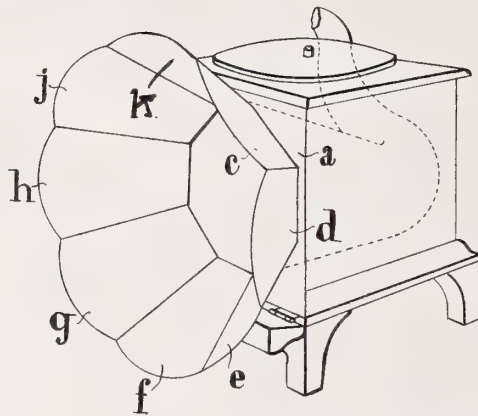


Fig. 4.

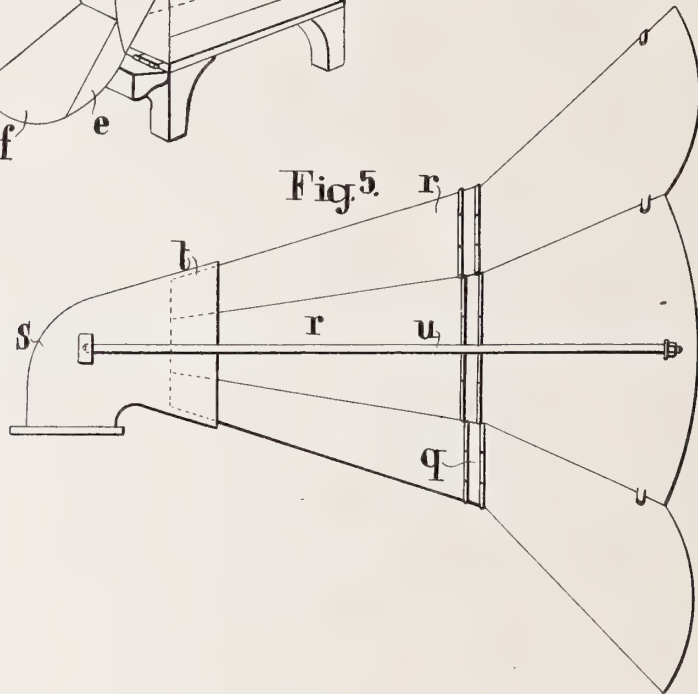


Fig. 5.

Witnesses:  
J. Spineta  
B. B. Collings

Inventor:  
J. M. Landon  
By Wilbur, Fisher & Witherspoon  
his Attorneys

# UNITED STATES PATENT OFFICE.

JOSEPH MARGULIES LANDON, OF UPPER NORWOOD, LONDON, ENGLAND.

## TRUMPET.

1,029,502.

Specification of Letters Patent.

Patented June 11, 1912.

Application filed March 11, 1910. Serial No. 548,667.

*To all whom it may concern:*

Be it known that I, JOSEPH MARGULIES LANDON, a subject of the King of England, residing at 20 Central Hill, Upper Norwood, in the county of London, England, have invented certain new and useful Improvements in Trumpets, and do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention refers to talking machines and relates especially to the horn or sound amplifying device for use in connection with such machine.

Considerable inconvenience has been experienced with talking machines of all classes owing to the fact that a large trumpet has to be used in order to secure the best results, which trumpet is unsightly and also extremely cumbersome when it is required to transport the machine from place to place. Various machines have already been devised fitted in cabinets, with a sound conduit located in the cabinet, but it is found that the reproduction from a machine of this type is not so satisfactory as when the ordinary trumpet or horn is used owing to the restricted dimensions of the trumpet and to the lack of a proper bell portion.

My present invention refers to a method of constructing a trumpet either alone or in connection with the cabinet containing the talking machine in such a way that the whole trumpet or the bell portion can be folded into a very small compass and yet when opened a full-sized trumpet or one of any required dimensions is formed.

It will be understood that in carrying out my invention any polygonal arrangement may be employed and the invention is not limited in this respect nor to the exact details shown and described; still for the purpose of disclosure, reference is had to the accompanying drawings illustrating practical embodiments of same and to the following description referring, for simplicity only, to an octagonal aperture with a corresponding number of trumpet sections, but it will be understood that the following disclosure is merely by way of example and the constructional form may be varied largely to suit the requirements of special cases, without departing from the spirit of the invention.

In order that my said invention may be

more clearly understood, I will now proceed to describe by way of example various methods of carrying out the same by making either the bell portion or the whole trumpet from a number of sections capable of being folded into a small space, and attachable either to a cabinet or to an ordinary or special elbow in connection with the sound arm of the talking machine.

In the drawings Figure 1 is an elevation of the bell portion of a trumpet formed from folding flaps with the flaps closed; Fig. 2 is a similar view showing the flaps open; Fig. 3 is a detail of the fastening of the flaps together. Fig. 4 is a diagrammatic view showing a device such as that illustrated at Figs. 1 and 2 attached to the front of the cabinet of the talking machine. Fig. 5 shows a whole trumpet built up from hinged flaps.

Referring to the method of carrying out the invention shown at Figs. 1 to 3, *a* is a square board or framework having an octagonal hole cut therein. Each of the faces of this hole is beveled off at *b*, the angle of the beveled portion depending upon the angle at which the flaps are to open out. *c*, *d*, *e*, *f*, *g*, *h*, *j* and *k* are eight flaps. These flaps are of such size and shape, as will be seen clearly from Fig. 2, that when they are opened out and rest against the beveled portions *b* of the framework *a* their edges exactly meet. In order that they may fold over one another as shown in Fig. 1, each flap is shorter at the bottom than the preceding flap, and the flaps are attached on the sloping edges *b* by means of hinges *m*, each hinge being placed slightly higher up the slope than the hinge on the preceding flap. It will thus be observed that the hinge *m* on the flap *c* is higher than that on the flap *d*, so that when the last flap *k* is reached this is considerably lower than its corresponding slope *h*. This enables the flaps to be all folded over one another as shown at Fig. 1, as before stated, and yet when open the outer curved portions of the flaps all correspond, forming a regular trumpet bell when in position. In order to hold the flaps in the open position any suitable fastening device may be provided, for instance the one shown at Fig. 3, where each flap is provided with a projection *n* taking into a corresponding notch or cavity *p* in the next flap.

Referring to Fig. 4 this shows a diagrammatic view of a device such as that de-

scribed with reference to Figs. 1 to 3 attached to the front of a cabinet of a talking machine. It will be understood that the tone arm connected with the sound box is prolonged into or communicates with a trumpet which is bent in such a way as to avoid the motor and opens at the side of the cabinet at the bottom of the flaps at the octagonal aperture in the frame *a*.

Referring to Fig. 5 this shows a method of constructing an entire trumpet according to my invention. In this case *g* is an octagonal frame made with a series of steps, so that the flaps may fold flat over one another as before explained. The outer flaps forming the bell are similar to the flaps *c*, *d*, *k* already described. To the other side of each step is hinged another flap, of diminishing taper, *r*. These flaps *r* are of such taper that when opened out and their edges meeting, they form a portion of a trumpet. *s* is an ordinary elbow joint provided with a socket *t*, into which the smaller ends of the flaps *r* take. *u* is a stay extending from the elbow *s* to one of the flaps of the bell portion to steady the whole and help to sustain the weight, one of such stays *u* being preferably provided at each side of the finished trumpet.

Having thus described a practical and preferred embodiment of the invention, the particular features of novelty will now be pointed out more succinctly in the following claims:

1. A trumpet comprising a support having a polygonal aperture therein and a plu-

rality of sectional trumpet flaps, each flap pivoted at its inner edge to said support adjacent an edge of said aperture and in a position offset from the position of its adjacent flaps, whereby said flaps may be folded into a flat position and opened to form a complete bell, substantially as described.

2. A trumpet comprising a support provided with a polygonal aperture having beveled edge faces, and a sectional trumpet flap pivotally connected to each beveled face at a position varying from the pivotal position of its complementary flaps, substantially as described.

3. A trumpet comprising a central support having a polygonal aperture therein, a plurality of sectional trumpet flaps, each flap pivoted to said support adjacent an edge of said aperture on one side of said support, forming the bell portion of the trumpet when assembled, and a plurality of sectional flaps similarly connected to the opposite side of said support and forming a continuation of the bell portion of the trumpet, the whole arranged so that both sets of said flaps may be folded into a flat superposed position, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

JOSEPH MARGULIES LONDON.

Witnesses:

A. E. VIDAL,  
THOS. ROWLEY.



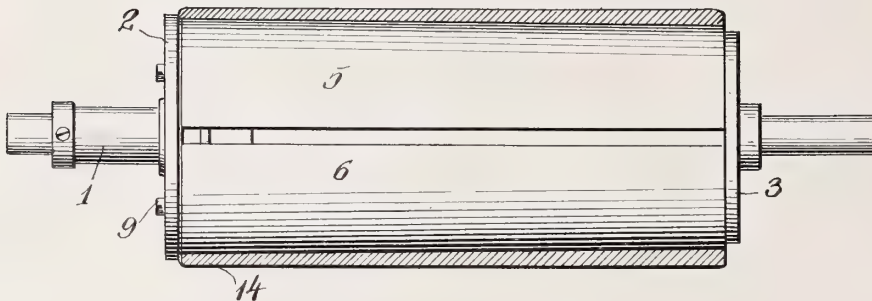


F. X. HOFBAUER.  
SUPPORT FOR CYLINDRICAL SOUND RECORDS.  
APPLICATION FILED NOV. 3, 1910.

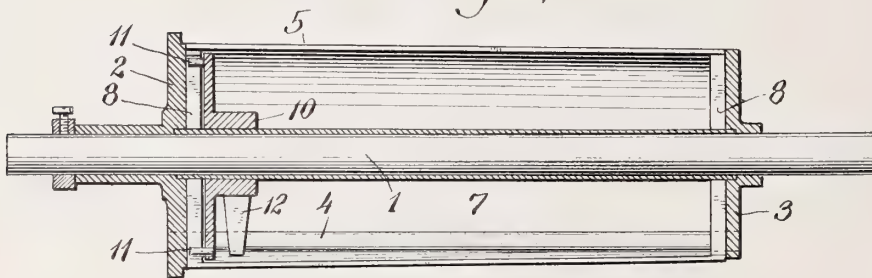
1,029,808.

Patented June 18, 1912.

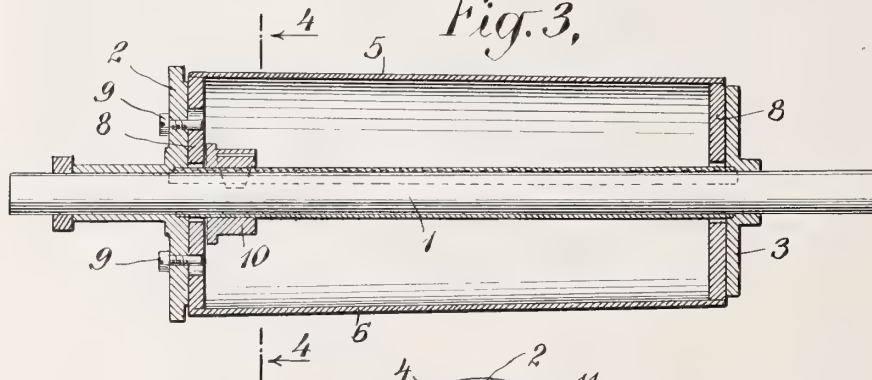
*Fig. 1,*



*Fig. 2,*

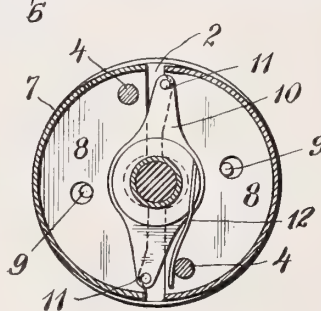


*Fig. 3,*



WITNESSES:

*Fig. 4,*  
*Joseph F. Collins.*



INVENTOR

*Frank X. Hofbauer*

BY

*J. P. Edwards*

ATTORNEY

# UNITED STATES PATENT OFFICE.

FRANK X. HOFBAUER, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO GEORGE S. IDDIGS, OF CLEVELAND, OHIO.

## SUPPORT FOR CYLINDRICAL SOUND-RECORDS.

1,029,808.

Specification of Letters Patent.

Patented June 18, 1912.

Application filed November 3, 1910. Serial No. 590,468.

*To all whom it may concern:*

Be it known that I, FRANK X. HOFBAUER, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Supports for Cylindrical Sound-Records, of which the following is a specification.

This invention relates to talking machines of the type employing sound-records of cylindrical form and has reference more particularly to the construction of the supports on which the sound-records are mounted in such machines.

In talking machines using cylindrical sound-records, it is common to provide a mandrel for supporting the record provided with a tapered exterior surface and the interior of the record is also slightly tapered so that when the record is moved upon the mandrel it will come to rest in a position in which it is held firmly.

In different records, and particularly in records put out by different manufacturers, the size of the opening through the record varies, and, with the forms of supports for cylindrical sound-records now commonly used, this variation causes a proportionate variation in the position in which the record is held upon the mandrel lengthwise of the mandrel.

In some machines, as for instance those of the magazine type, it is important that the record always assume the same position longitudinally of the support in order that proper coaction with the reproducing mechanism may be obtained and the record must be held in this position with sufficient rigidity to preclude movement thereof relatively to the support during the operation of the machine.

The present invention involves the provision of a support for a cylindrical sound-record specially constructed so as to fulfil the conditions above set forth without detracting from the facility with which the record may be placed upon it or removed therefrom. In accordance with the invention, a support is provided having a tapered cylindrical surface on which the record is received and at the end of this surface a stop projection, preferably a circumferential flange, against which the end of a record abuts so that in every case the record will lie upon the mandrel in the same

position relatively to the length of the mandrel. The tapered cylindrical surface of the mandrel is so made that it can yield radially and the parts thereof are pressed outwardly to a predetermined extent with a yielding pressure; in this way the records will always be held firmly upon the mandrel when moved thereon into coaction with the stop though there be considerable variation in their interior diameter. The outward movement of the parts forming the cylindrical surface is suitably limited so that in no case would the smaller end of the support be expanded to such extent that a record would not slide thereon readily.

The mechanism whereby the exterior surface of the support is made adjustable in diameter and subjected to yielding pressure is simple in construction and may be manufactured at very low cost.

The preferred embodiment of the invention is illustrated in the accompanying drawings in which—

Figure 1 is a plan view of the support showing a record thereon in section, Fig. 2 is a longitudinal sectional view of the support, Fig. 3 is a longitudinal sectional view of the support at right angles to the section of Fig. 2 and Fig. 4 is a transverse section on line 4—4 of Fig. 3.

Referring to these drawings, 1 indicates the shaft of the mandrel or support and 2 and 3 are heads secured thereon. Extending between these heads are two or more rods 4 parallel to shaft 1 but at a distance therefrom, preferably near the periphery of heads 2 and 3. These rods 4 form pivotal supports for parts 5 and 6 forming the cylindrical tapered surface of the mandrel. In the present instance two of these parts are employed, each consisting of a wall of semi-circular cross-section and semi-circular end-pieces 8 at the ends of this wall 7. The walls 7 of the two parts form a practically complete cylinder tapered slightly and of a length approximately the same as a sound-record. The end-pieces 8 have semi-circular half-bearings formed therein and bear upon the shaft 1. The end-pieces 8 of each part 5 and 6 have alined openings therein through which a shaft 4 extends so that each part 5 and 6 can turn about its shaft 4 as a center; such turning movement, however, is limited by stops 9 projecting through the head 2 and entering loosely into

openings formed in the adjacent end-pieces 8.

Mounted upon shaft 1 is a cross-head 10 adapted to turn loosely on the shaft. At the ends of this cross-head are pins 11 projecting laterally between the end-pieces 8 of the parts 5 and 6. Also secured to the cross-head 10 is a leaf-spring 12, one end of which projects under one of the rods 4 and presses thereon in a direction to turn the cross-head about shaft 1. When the cross-head is so turned by spring 12, the pins 11 thereon engage the edges of the end-pieces 8 adjacent to head 2 and turn the parts 5 and 6 about the rods 4. The head 2 is of such diameter that it projects beyond the parts 5 and 6 when those parts are moved radially outward as far as is permitted by the stops 9.

In using a machine equipped with this form of support, a cylindrical record 14 is mounted upon the support by moving it over the parts 5 and 6 until its end engages the projecting edge of the head 2 whereupon lengthwise movement of the record relatively to its support is arrested. This insures that the record will be in the proper position with relation to the reproducing mechanism. As the record is moved thus, the parts 5 and 6 will yield and move radially inward to such extent as may be necessary, the parts turning about the rods 4 and against the tension of the spring 12. When the record has reached the end of this movement with its end against the head 2, the spring 12 acts on cross-head 10 to turn it about shaft 1 and the pins 11 on the cross-head press on the end-pieces of the parts 5 and 6 so that those parts are subjected to pressure tending to turn them about rods 4 radially outward. This causes the parts 5 and 6 to press against the interior walls of the record with a force quite sufficient to cause the record to be held tightly.

It will thus be seen that with this form of support cylindrical records varying in internal diameter may be mounted with the requisite rigidity upon the support and all in the same position relatively to the length of the support. Furthermore, the construction whereby these desirable characteristics are obtained is very simple and capable of manufacture at very low cost.

Having described my invention, what I claim as new therein and desire to secure by Letters Patent of the United States is:

1. A support for a cylindrical sound-record, comprising a shaft, two heads secured thereon, rods extending between said heads, parts pivotally mounted on said rods and presenting a substantially cylindrical tapered exterior surface, a cross-head loosely mounted on said shaft within said parts and coacting at each end with one of said parts, and a spring engaging said cross-head and acting thereon to turn the cross-head upon said shaft and thus actuate said pivotally mounted parts, substantially as set forth.

2. A support for a cylindrical sound-record comprising a shaft, two heads secured thereon, rods extending between said heads, parts pivotally mounted on said rods presenting a substantially cylindrical tapered exterior surface, a cross-head loosely mounted on said shaft within said parts and provided with projections each engaging one of said parts and a single flat spring coacting with the cross-head and one of said rods and acting to turn the cross-head upon said shaft, substantially as set forth.

This specification signed and witnessed this 1st day of November, 1910.

FRANK X. HOFBAUER.

Witnesses:

D. S. EDMONDS,  
JOSEPH F. COLLINS.





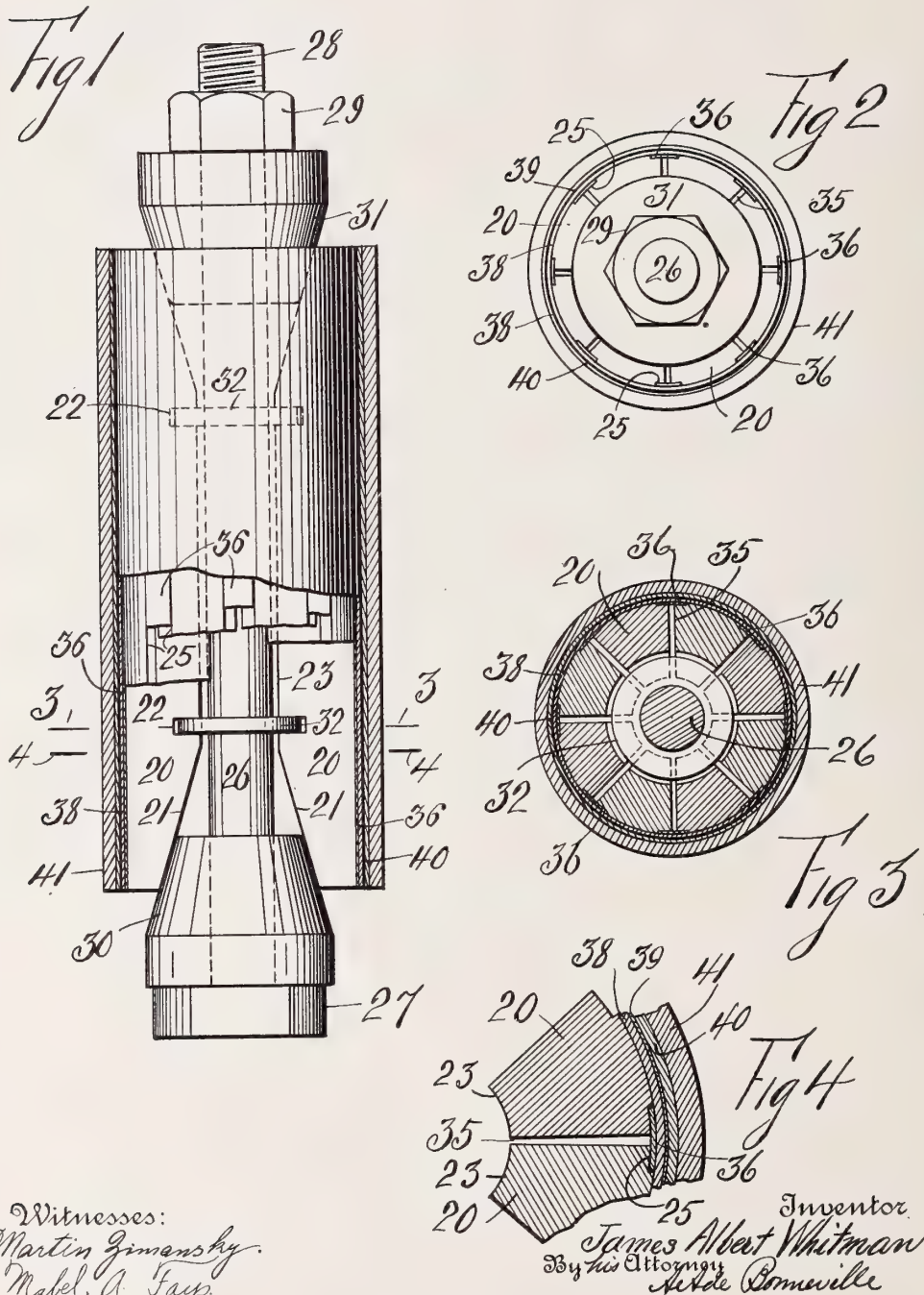


J. A. WHITMAN.  
 APPARATUS FOR MAKING PHONOGRAPH RECORDS.  
 APPLICATION FILED SEPT. 28, 1910.

1,030,364.

Patented June 25, 1912.

2 SHEETS—SHEET 1.



Witnesses:  
 Martin Gimensky.  
 Mabel A. Fay.

Inventor.  
 James Albert Whitman  
 By his Attorney  
 Wade Combsville

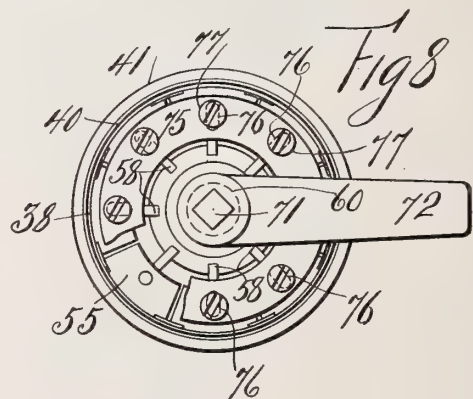
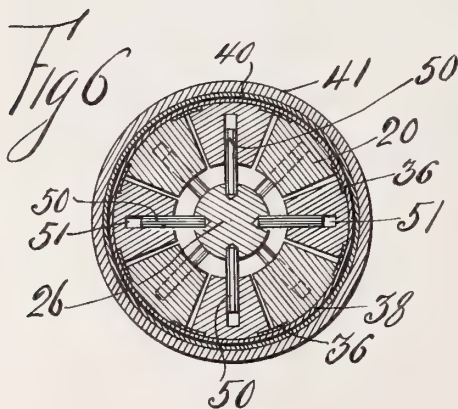
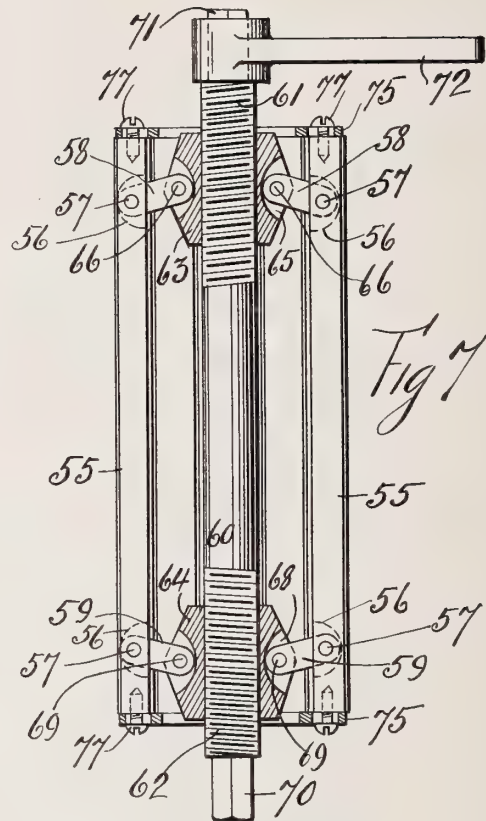
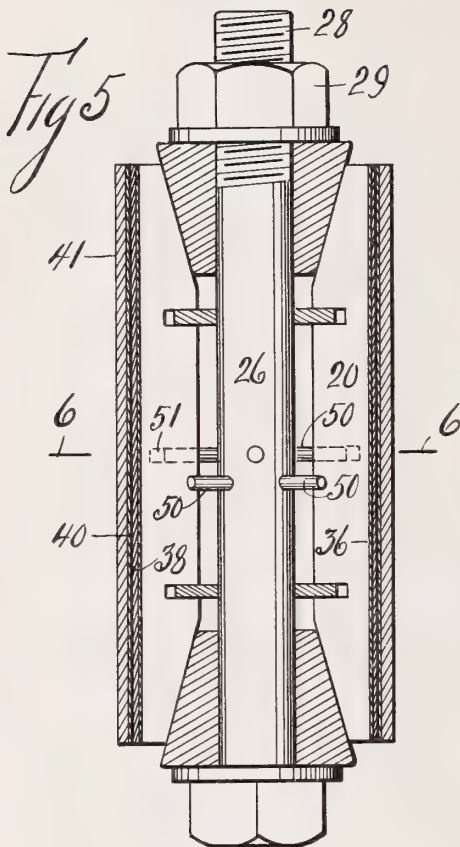


J. A. WHITMAN.  
 APPARATUS FOR MAKING PHONOGRAPH RECORDS.  
 APPLICATION FILED SEPT. 28, 1910.

1,030,364.

Patented June 25, 1912.

2 SHEETS-SHEET 2.



Witnesses:  
 Martin Gimansky.  
 Mabel A. Fair.

Inventor  
 James Albert Whitman  
 By his Attorney  
 Arthur B. Bormville



# UNITED STATES PATENT OFFICE.

JAMES ALBERT WHITMAN, OF GRANTWOOD, NEW JERSEY.

## APPARATUS FOR MAKING PHONOGRAPH-RECORDS.

1,030,364.

Specification of Letters Patent.

Patented June 25, 1912.

Application filed September 28, 1910. Serial No. 584,189.

*To all whom it may concern:*

Be it known that I, JAMES ALBERT WHITMAN, a citizen of the United States, and a resident of Grantwood, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Making Phonograph-Records, of which the following is a specification.

10 This invention relates to apparatus for making phonograph records. Its organization comprises means for evenly forcing or pressing a tube of celluloid, a paper tube coated with celluloid, or a cylindrical surface of any other suitable material against a matrix from which a sound record is to be taken.

15 The invention is characterized by its means of mechanically and uniformly pressing a tube against the impressions of a matrix.

In the accompanying drawings Figure 1 shows an elevation partly in section of one form of my invention, Fig. 2 shows a top plan view of Fig. 1, Fig. 3 is a section of Fig. 1 on the line 3, 3, Fig. 4, shows an enlarged partial section of Fig. 3 on the line 4, 4, Fig. 5 represents an elevation and partial longitudinal section of a modification of the invention, Fig. 6 shows a section of Fig. 5, on the line 6, 6, Fig. 7 represents an elevation and partial section of another form of the invention and Fig. 8 shows a top plan view of Fig. 7 with a portion thereof broken away.

Referring to Figs. 1 to 4, a plurality of segmental pressing bars 20 are shown with the tapered inner ends 21. Cross grooves 22 extend from the inner faces 23 of said bars and longitudinal indentations 25 are formed on the outer surfaces thereof. A central clamping bolt 26 with the head 27, threaded end 28 and nut 29 is shown in the axial line of the plurality of the segmental pressing bars. Frustum shaped pressing plugs 30 and 31 are slidably supported on the bolt 26, and collars 32 fitted on the said bolt engage the grooves 22 to assist in maintaining the pressing bars in proper operative positions, although the said collars may be omitted. The plug 30 may be secured to the bolt 26, or may be formed therewith. In the longitudinal indentations 25 of the bars 20 are located the cover strips 36 which cover the joints 35 between the accompanying sides of the bars 20.

Over both the outside surfaces of the bars 20, and the strips 36 is forced the cushion tube 38 of rubber having a cloth cover 39.

The apparatus thus far described is shown within the barrel or tube 40 of celluloid or other suitable material, which is to take impressions from the matrix 41 represented on the outside of said barrel or tube 40.

To use the invention the parts are located as shown in said Figs. 1 to 4, and the operator screws up the nut 29 before or while the matrix is being heated. This will cause the pressing plugs 30 and 31, to bear against the tapered ends 21 of the pressing bars 20, and the tube 40 will be evenly and uniformly pressed against the inner surface of the matrix 41 to receive the impressions therefrom. The operator then releases the nut 29 which allows the cushion tube 38 to force the pressing bars 20 together, to allow the separation of the barrel 40 from the matrix 41, before the latter has shrunk to its normal diameter. It will be noted that a second function of the cushion tube 38 is to provide a uniform and elastic bed or support for the barrel 40 when the latter is pressed against said matrix.

In Figs. 5 and 6 the invention is modified by securely fastening pins 50 to the central clamping bolts 26, and guide openings 51 are formed in the segmental pressing bars 20 for said pins 50. By these means the said bars are guided in their movements to and from the said bolt 26.

In Figs. 7 and 8 the invention is shown to comprise a plurality of segmental pressing bars 55, which have the slots 56 extending from their inner surfaces and adjacent to their ends. Pins 57 in said bars pass through said slots 56 and have pivoted thereon the links 58 and 59. In the axial center of the plurality of the segmental pressing bars 55 is located the central clamping screw 60, with the right hand threads 61 at one end, and the left hand threads 62 at the other end. With the threads 61 is engaged the nut 63 and with the threads 62 is engaged the nut 64. Slots 65 are formed in the nut 63 and through which pass pins 66 that engage the links 58 thereto. In the nut 64 are formed slots 68 through which pass pins 69 for the links 59. The ends of the screw 60 terminate in the square shanks 70 and 71, and a wrench 72 can be applied to either of said shanks. At the ends of the bars 55 are located the guide rings 75, which



have formed therewith the radial slots 76, and screws 77 extending from the ends of the bars 55 to engage the slots 76.

Having described my invention what I desire to secure by Letters Patent and claim is:

1. In an apparatus for making phonograph records the combination of a plurality of segmental pressing bars, pressing plugs engaging said bars, longitudinal cover strips over the adjacent sides of each pair of said bars and a cushion tube encircling said bars and strips.

2. In an apparatus for making phonograph records the combination of a central clamping bolt, threads formed on the bolt, a nut in engagement with the threads, a pair of frustum shaped pressing plugs connected up with the bolt with one axially slidable on the bolt and bearing against said nut, a plurality of pressing bars encircling said bolt, cover strips over the joints between the adjacent sides of said pressing bars and a cushion tube encircling said bars and strips, to bear against a tube to force the latter against a matrix.

3. In an apparatus for making phonograph records the combination of a central clamping bolt, threads formed on the bolt, a nut in engagement with the threads, a pair of plugs connected up with the bolt with one axially slidable on the bolt and bearing against said nut, a plurality of

pressing bars encircling said bolt, cover strips over the joints between the adjacent sides of said pressing bars, a cushion tube encircling said bars and strips, and a cover for said cushion tube.

4. In an apparatus of the character described the combination of a central clamping bolt, a pair of collars on the bolt, a pair of frustum shaped pressing plugs connected up with the bolt, a plurality of segmental pressing bars having indentations on their outer surfaces and with grooves extending from their inner surfaces, the latter to register with the collars on the bolt, tapered ends on the bars to register with the pressing plugs, threads on the bolt, a nut engaging said threads to bear against one of the pressing plugs, longitudinal cover strips in the indentations of the pressing bars to cover the joints between the adjacent sides of the pressing bars, a cushion tube encircling said bars and strips, and a cover over said cushion tube to bear against a pliable tube to force the latter against a matrix to form impressions on the pliable tube.

Signed in the borough of Manhattan in the county of New York and State of New York this 24th day of September A. D. 1910.

JAMES ALBERT WHITMAN.

Witnesses:

MARTIN ZIMANSKY,  
CHAS. C. GILL.

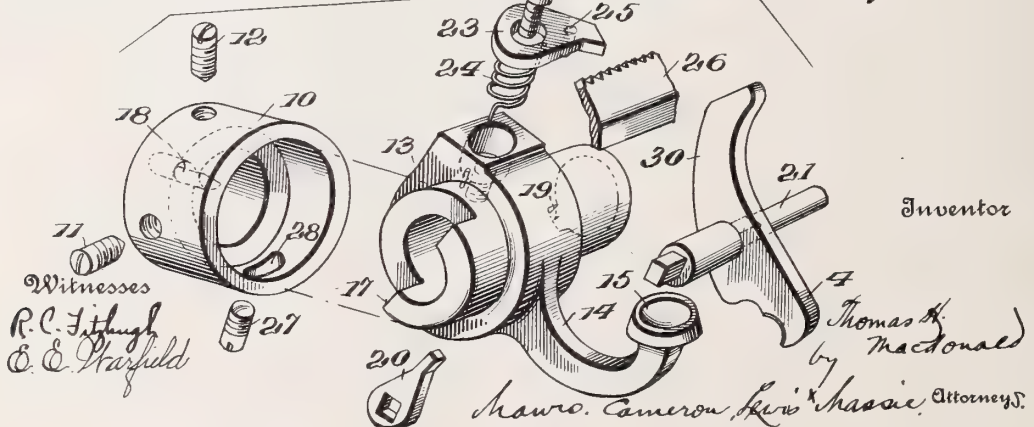
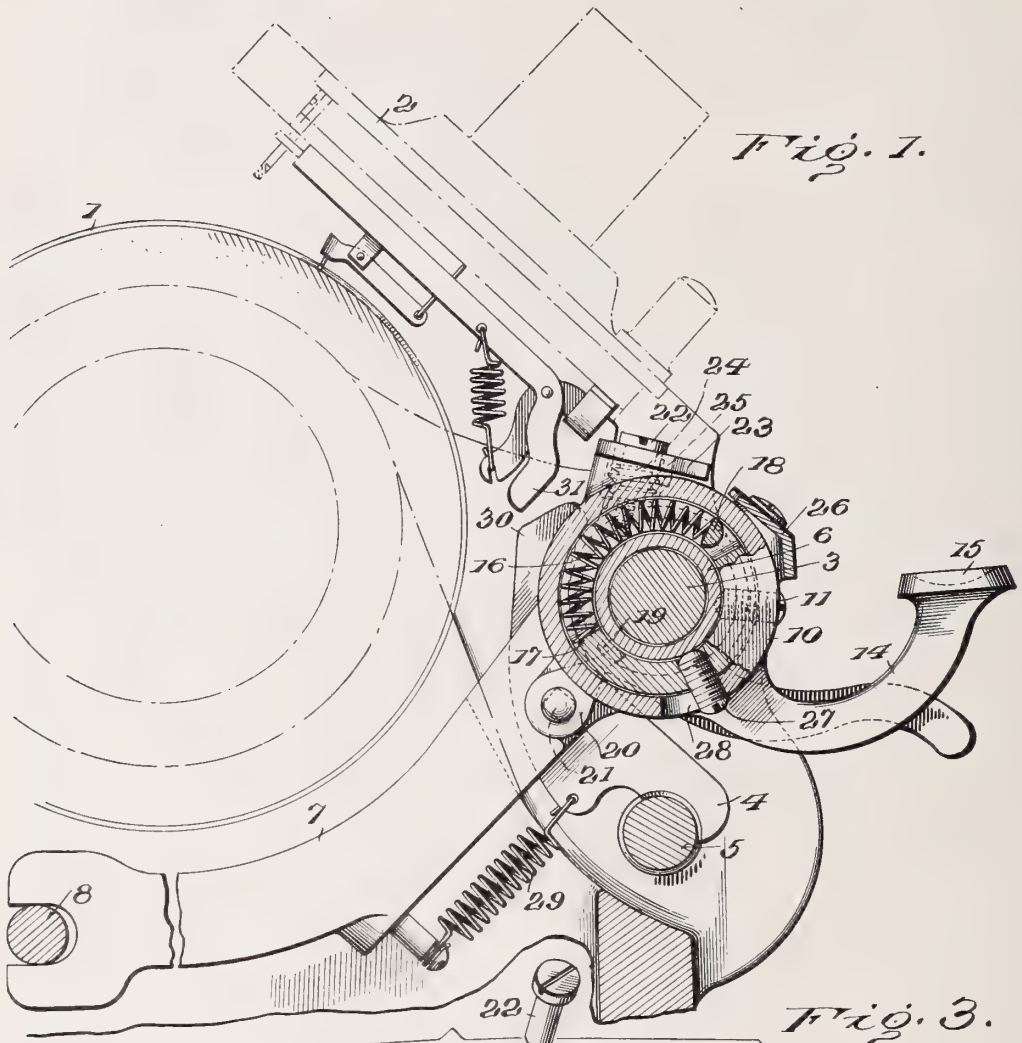


T. H. MACDONALD.  
 BACK SPACER FOR DICTAPHONES.  
 APPLICATION FILED AUG. 29, 1911.

1,030,740.

Patented June 25, 1912.

2 SHEETS—SHEET 1.







T. H. MACDONALD.  
 BACK SPACER FOR DICTAPHONES.  
 APPLICATION FILED AUG. 29, 1911.

1,030,740.

Patented June 25, 1912.

2 SHEETS-SHEET 2.

Fig. 2.

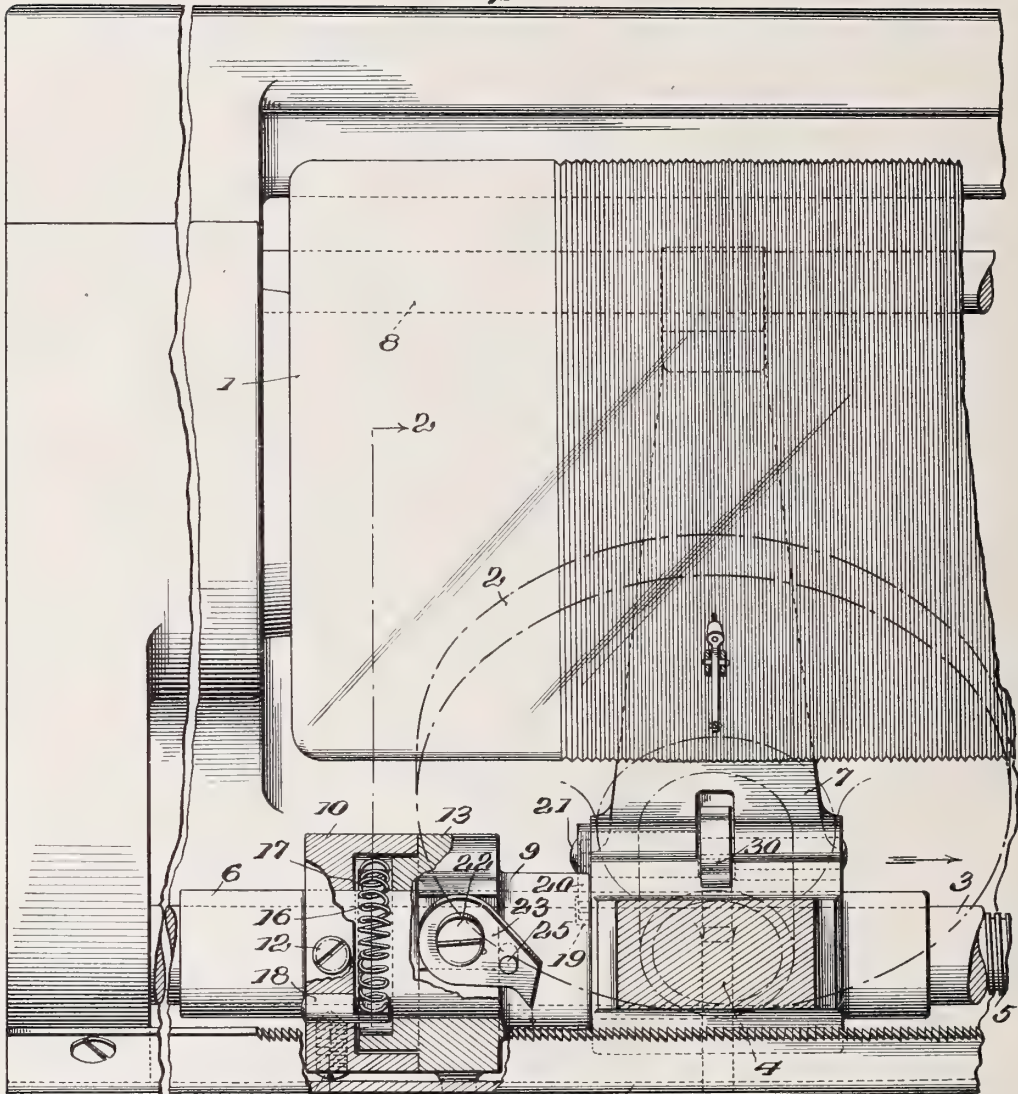
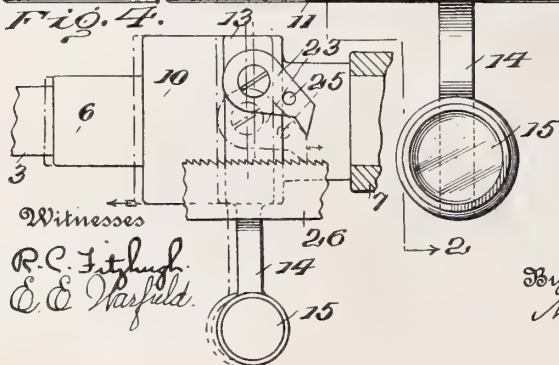


Fig. 4.



Inventor

Thomas H. Macdonald.

By *Mauro, Cameron Lewis & Macsick*  
 Attorneys.

# UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO AMERICAN GRAPHOPHONE COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF WEST VIRGINIA.

BACK-SPACER FOR DICTAPHONES.

1,030,740.

Specification of Letters Patent.

Patented June 25, 1912.

Application filed August 29, 1911. Serial No. 646,719.

*To all whom it may concern:*

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented a new and useful Improvement in Back-Spacers for Dictaphones, which invention is fully set forth in the following specification.

This invention relates to dictaphones, or that class of talking machines designed for taking dictation which is subsequently transcribed, and more particularly to the reproducing portion or element of the machine.

In machines of this character, it is desirable for the operator who is transcribing the record to repeat certain portions of the record, that is, to place the reproducer back for a short distance, in order that the last portion of the record reproduced may be repeated.

The particular object of the present invention is to provide a simple and efficient means for throwing the reproducer back for a short distance over the record; in other words, to back space the reproducer for the purpose of securing the repetition of the part of the record that has just been reproduced.

With this object in view, the invention consists in the construction, combination and arrangement of elements hereinafter more fully described, and then pointed out in the claims.

The inventive idea is capable of receiving a variety of mechanical expressions, one of which, for the purpose of illustrating the invention, is shown in the accompanying drawings, in which—

Figure 1 is an end elevation of a machine, with parts shown in section, taken on line 2—2, Fig. 2. Fig. 2 is a broken plan view thereof; Figs. 3 and 4 are broken details of portions of the back-spacing device.

Referring to the drawings, in which like reference numerals indicate like parts, 1 indicates the record carried on a suitable mandrel, and revolved by a suitable motor mounted in the framework of the machine, in the usual manner. 2 indicates the reproducer mounted on the usual or any suitable carriage, traveling on the slide rod 3 longitudinally past the record, being propelled by means of the feed nut 4 engaging the feed screw 5, which is propelled by the

motor of the machine. The carriage is provided with the usual sleeve 6 embracing the slide rod 3, and with a downwardly depending guide arm 7 embracing the guide rod 8. All of the parts thus described are of the usual or any suitable construction, and do not form any specific part of the present invention, and therefore need not be more fully described.

Mounted to turn on the sleeve of the carriage 6, between a part of the carriage 9 and a collar 10, fixed on the sleeve 6 by means of two set screws 11 and 12, is a hub 13, having an outwardly projecting arm or lever 14, which is provided on its end with a button 15 to fit the finger of the operator. In a recess on the left hand end of the hub or sleeve 13 is a coiled spring 16, reacting between an abutment 17 on the hub or sleeve 13 and the squared end of a pin 18 projecting from the collar 10 (see Fig. 2). The hub or sleeve 13 is provided with a cut-out portion or slot 19, into which projects the end of a lever 20 rigidly secured to the feed nut shaft 21, which shaft is mounted to turn in suitable bearings in the frame, the shaft being squared to fit a square hole in the feed nut, as shown, in order to insure a positive motion or turning of the feed nut with the shaft.

Pivoted on a stud 22 on the sleeve or hub 13 is a pawl 23, to which is secured one end of a coiled spring 24, the other end of said spring being secured to a part of the hub or sleeve 13. The turning movement of the pawl 23 is limited in one direction by the stop pin 25 engaging a shoulder on the sleeve or hub 13.

Mounted on the framework of the machine is a ratchet rack 26, in position to be engaged by the nose of the pawl 23 when the operating lever 14 is depressed against the tension of the spring 16. A screw 27 is fast to the sleeve or hub 13, and projects outward through a slot 28 formed in the collar 10.

Operation: Assuming the parts to be in reproducing position, as shown in Fig. 1, when the operator desires to set back the reproducer point for the purpose of repeating a portion of the record, she presses the button 15 downward, thereby turning the hub or sleeve 13, and compressing the coiled spring 16. By reason of the engage-



ment of the lever 20 in the slot or opening 19 of the sleeve 13, the feed nut shaft 21 is turned, thereby lifting the feed nut 4 off of the feed screw 5 against the tension of spring 29, and at the same time causing the upwardly projecting arm 30 of the feed nut to engage the lever arm 31 on the reproducer, and lift it so as to remove the stylus point from contact with the record.

10 The same downward depression of the button 15, with the consequent turning of the hub or sleeve 13, brings the pawl 23 into engagement with the ratchet rack 26, and the continued turning movement of the hub or sleeve 13 causes the pawl to act in the nature of a toggle, thereby forcing hub or sleeve 13, and with it the carriage of the machine, from right to left, as shown in full and dotted lines in Fig. 3, that is, for a slight distance, preferably about  $1/32$  of an inch, thereby giving the reproducer point the set-back desired to secure the proper repetition. If desired, the depressing action on the button 15 may be repeated several times to set the carriage back still farther. The turning movement of the sleeve or hub 13 on the carriage sleeve 6 is limited by the engagement of the screw-pin 27 in the slot 28, while the pawl 23 is always retained in its proper position by the torsion spring 24, which holds the stop pin 25 against the shoulder on the hub or sleeve 13.

What is claimed is:—

- 35 1. In a talking machine, the combination of a reproducer, a carriage therefor, a track or way for said carriage, a sleeve on said carriage, a collar on said sleeve, a hub mounted to turn on said sleeve and projecting into said collar, a lever attached to said hub to actuate the same, a toggle-pawl on said hub and a rack on the frame of the machine in position to be engaged by said pawl when the hub is turned by the lever.
- 40 2. In a talking machine, the combination of a carriage way, a reproducer-carriage moving on said way, a carriage propelling nut and screw, a collar mounted on said carriage, a hub mounted to turn on said carriage and projecting into said collar, a lever for turning the hub in one direction, a spring for turning said hub in the other direction, a stop limiting the turning movement of the hub, a rack on said machine

and a pawl on said hub engaging said rack 55 when turned in one direction only.

3. In a talking machine, the combination of a reproducer, a carriage therefor, a track or way for said carriage, a sleeve on said carriage, a collar fixedly mounted on said sleeve, a hub mounted to turn on said sleeve and projecting into said collar, a spring interposed and reacting between said collar and hub, a lever attached to said hub to operate the same, a toggle-pawl on said hub, 65 and a rack on the frame of the machine in position to be engaged by said pawl when the hub is turned by the lever.

4. In a talking machine, the combination of a reproducer, a carriage therefor, a track 70 or way for said carriage, a sleeve on said carriage, a collar fixedly mounted on said sleeve, a hub mounted to turn on said sleeve and projecting into said collar, a compression spring interposed and reacting between said collar and hub, a lever attached to said hub to operate the same, a toggle-pawl on said hub, means for limiting the movement of said pawl, and a rack on the frame of the machine in position to be engaged by 80 said pawl when the hub is turned by the lever.

5. In a talking machine, the combination of a reproducer, a carriage therefor, a track or way for said carriage, a feed screw, a sleeve on said carriage, a hub mounted to turn on said sleeve and provided with a slot, a lever attached to said hub to operate the same, a toggle-pawl on said hub, a rack 90 on the frame of the machine in position to be engaged by said pawl when the hub is turned by the lever, an arm engaging the reproducer at one end and the feed screw at the other, a pivot for said arm, a lever mounted on said pivot and engaging said slot whereby depression of the lever attached to the hub removes the stylus from the record, disengages the arm from the feed screw and moves the carriage rearward. 100

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

MARGARET MURRAY,  
SOPHIE B. MACDONALD.

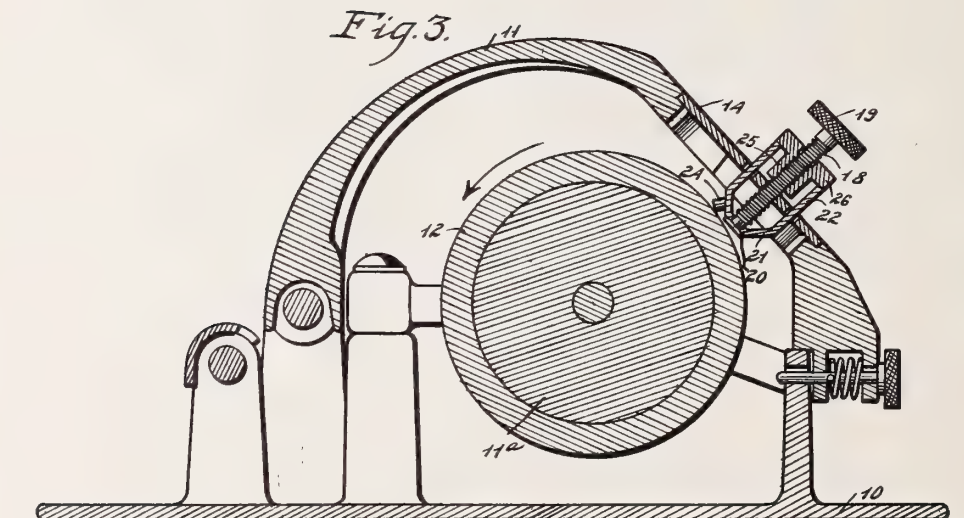
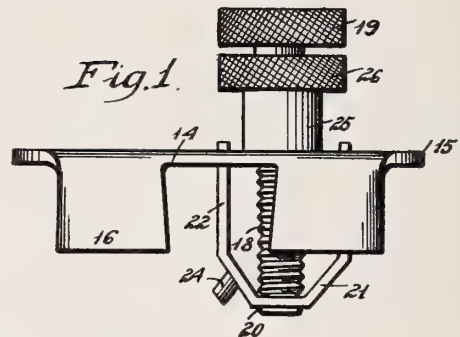
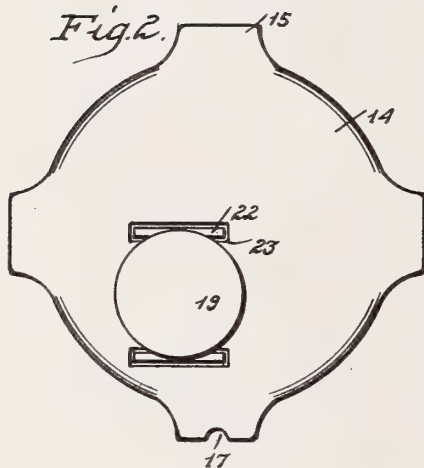




G. C. LA MOUNTAIN.  
 TRIMMER FOR PHONOGRAPH RECORDS.  
 APPLICATION FILED OCT. 16, 1911.

1,032,338.

Patented July 9, 1912.



Witnesses

W. A. Loftis.  
 W. P. Bair.

Inventor.

George C. La Mountain.  
 by J. Ralph Dwyer atty.

# UNITED STATES PATENT OFFICE.

GEORGE C. LA MOUNTAIN, OF MARSHALLTOWN, IOWA.

TRIMMER FOR PHONOGRAPH-RECORDS.

1,032,338.

Specification of Letters Patent.

Patented July 9, 1912.

Application filed October 16, 1911. Serial No. 654,834.

*To all whom it may concern:*

Be it known that I, GEORGE C. LA MOUNTAIN, a citizen of the United States, residing at Marshalltown, in the county of Marshall and State of Iowa, have invented a certain new and useful Trimmer for Phonograph-Records, of which the following is a specification.

It is my purpose to provide an attachment for phonographs of very simple, durable and inexpensive construction which may be readily attached to or detached from the frame which holds the reproducing instrument in an ordinary phonograph.

It is a further object of my invention to provide such an attachment in the nature of a trimmer or shaver for phonograph records, whereby the records may be trimmed or shaved off for further use, which trimmer is readily and easily adjustable to cut to any desired depth.

A further object is to provide such a device so constructed and arranged that it will not break or chip the record but will trim such records smoothly, regularly and evenly, thereby preparing a smooth, even surface for receiving a new impression.

A further object is to provide such a device which at all times presents the cutting edge to the record at the same angle, thus causing a true and even cut.

A further object is to provide such a device which holds the cutting instrument in exactly the same position during the trimming of a record.

My invention consists in certain details, in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 shows a side elevation of a trimmer for phonograph records embodying my invention. Fig. 2 shows a top or plan view of said trimmer. Fig. 3 shows a central, sectional view through my trimmer and parts of a phonograph showing my trimmer installed in position for use.

My improved trimmer for phonograph records is designed especially for use with phonographs using cylindrical records and is also designed to be secured to the ordi-

nary arm or bracket in which the reproducer is held.

In the accompanying drawings, I have used the reference numeral 10 to indicate the base of a phonograph. Mounted on the base is an arm 11 provided with means for holding the reproducer. On the conical block 11<sup>a</sup> is a cylindrical record 12 which is rotated by the phonograph in the direction indicated by the arrow in Fig. 3.

My improved trimmer comprises a body portion 14 comprising a flat metal plate approximately circular in form having lateral projections 15 and downwardly turned flanges 16 which alternate with said projections 15. In one of the projections 15, nearest the screw 18 which will hereinafter be described, is a notch 17. The form of the body just described and the construction of the parts 15 and 16 together with the notch 17 is such that my trimmer may be held by the same means which holds the reproducer, as shown in Fig. 3. The body 14 is provided with a screw threaded opening near the extension 15 in which is formed the notch 17 and off center. In this opening is mounted a screw 18 on which is the head 19. On the lower end of the screw 18 is a smooth portion on which is rotatably mounted a plate 20 which has arms 21 inclined outwardly and toward the body 14 from the plate 20. At the ends of the arms 21 are flat guide arms 22 arranged at right angles to the body portion 14 and mounted in slots 23 in said body portion 14 on each side of the screw 18.

It will be seen that when the screw 18 is revolved so as to move inwardly or outwardly, with relation to the body 14, the guide arms 22 and the parts connected therewith will be raised or lowered with relation to said body 14.

Extending from one of the arms 21 is a cylindrical cutting member 24 which, when the trimmer is in position for operation, rests with one side of its lower end against the record 12, as shown in Fig. 3.

By setting the cutting instrument, as above described, when the record is set in motion, its surface is scraped without chipping or cutting the record. The cutting edge of the cutting instrument 24 is made of high grade steel. The screw 18 and the guide arms 22, together with the parts at-



tached thereto are so constructed and arranged that the guide arm 22 nearest to the cutting arm 24 is in line with the radius from the middle of the record to the outer surface thereof. The edge of the cutter member which engages the surface of the record is also in the line of said radius. It therefore follows that as the screw 18 is moved up or down the guide arm 22 nearest the cutting instrument 24 and the cutting edge of said instrument will be moved up and down with relation to the record on the line of said radius. It further follows that the cutting edge will always be presented to the surface of the record at exactly the same angle.

Mounted on the screw 18 above the body 14 is a nut lock comprising a screw threaded sleeve 25 and a head 26 thereon. The said nut lock is designed to lock the screw 18 in any position of its movement. The operation of locking may be accomplished by revolving the sleeve 25 on the screw 18 until said sleeve engages the upper surface of the body 14, as shown in Fig. 1. In cases where the upper ends of the guide arms 22 extend to a considerable distance above the body 14 the screw 18 can be locked by screwing the head 26 against the upper ends of the guide arms 22, as shown in Fig. 3. When the screw 18 is locked by either method the cutting instrument 24 is firmly held in position.

In the practical use of my improved trimmer for phonograph records, I first attach the trimmer to the arm 11 which ordinarily holds the reproducer. The record 12 is placed in position on the block 11<sup>a</sup> and the screw 18 is rotated by means of the head 19 until the cutter edge is adjusted with reference to the surface of the record to make the proper cut. The nut lock is then turned until the screw 18 is locked in position. The record can then be set in motion and trimmed.

It will be noticed that my trimmer may be easily and quickly adjusted to cut at any desired depth. By using a screw with a slight pitch such as that shown in my drawings, this adjustment may be made very accurate and the depth of the cut regulated to a very fine degree.

By means of the lock nut having the sleeve 25 and the head 26 the screw 18 may be firmly fixed in any position of its movement. By using the screw 18 and the lock nut the cut is made absolutely regular and even. No movement of the parts is permitted whereby the cut may be accidentally deepened or moved out of the true line. It is to be noted that the edge of the cutting instrument covers a considerably wider space than the reproducer point and therefore travels more than once over each part of the surface of the record.

On account of the construction heretofore

set forth, whereby the cutter edge is moved up and down on a radial line with reference to the record, the cutting edge stands always exactly at the same angle with relation to the surface of the record.

My improved trimmer for phonograph records is quickly and easily attached to the part of the phonograph which ordinarily holds the reproducer; is composed of few and simple parts which are inexpensive to manufacture and extremely durable. My trimmer can be made at such a small cost that one can be used with each phonograph at a cost not out of proportion to the cost of the phonograph.

I claim as my invention:

1. In a device of the class described, a body designed to be held by the ordinary means which holds the reproducer on a phonograph, a screw mounted in said body at right angles thereto, guide arms slidably mounted in said body on each side of said screw, arms extending from the lower ends of said guide arms to the lower end of said screw and rotatably mounted thereon, a cutting instrument extending from one of said last named arms, the cutting edge of said instrument and the guide arm nearest thereto being movable on a radial line with relation to a phonograph record, and means for securing said screw in any position of its movement.

2. In a device of the class described, a body designed to be held by the ordinary means which holds the reproducer on a phonograph, a screw mounted in said body at right angles thereto, guide arms slidably mounted in said body on each side of said screw, arms extending from the lower ends of said guide arms to the lower end of said screw and rotatably mounted thereon, a cutting instrument extending from one of said last named arms, the cutting edge of said instrument and the guide arm nearest thereto being movable on a radial line with relation to a phonograph record, and means for securing said screw in any position of its movement, said means comprising a screw threaded sleeve mounted on said screw above said body portion, a head on the upper end of said sleeve, said sleeve and head being so arranged that in some positions of the movement of said guide arms said sleeve may be moved to position in engagement with said body, and in other positions of said guide arms said head may be moved to position in engagement with the upper ends of said guide arms.

3. In a device of the class described, a body designed to be held by the ordinary means for holding a reproducer, a screw mounted in said body at right angles thereto, a plate rotatably mounted on the lower end of said screw, arms extending from said screw outwardly and toward said body,

guide arms extending from said arms at  
right angles to said body in which said  
guide arms are slidably mounted, a cylin-  
drical cutting instrument mounted on one  
5 of said first named arms in such position  
that the guide arm nearest to said cutting  
instrument and said cutting instrument are  
on a radial line with reference to a phono-  
graph record, the cutting edge of said in-

strument being arranged at an acute angle 10  
with the surface of a phonograph record  
and being designed to be dragged over said  
surface.

Des Moines, Iowa, September 25, 1911.

GEORGE C. LA MOUNTAIN.

Witnesses:

R. P. SCOTT,

D. R. SALISBURY.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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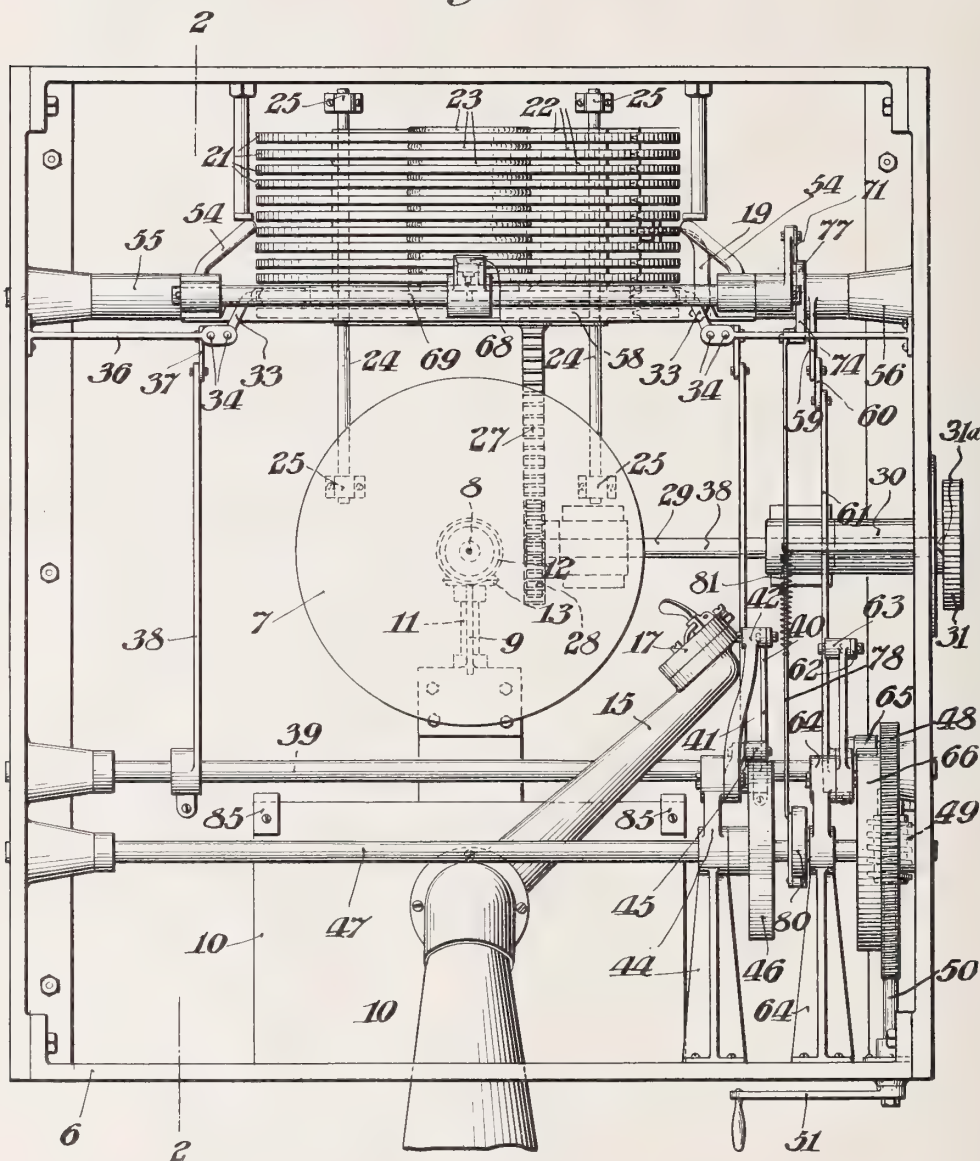
J. WELLNER.  
 RECORD CHANGING MECHANISM FOR SOUND REPRODUCING MACHINES.  
 APPLICATION FILED JAN. 23, 1912.

1,032,573.

Patented July 16, 1912.

3 SHEETS—SHEET 1.

Fig. 1.



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 G. P. Sharkey.

BY

A. V. Jones

ATTORNEY





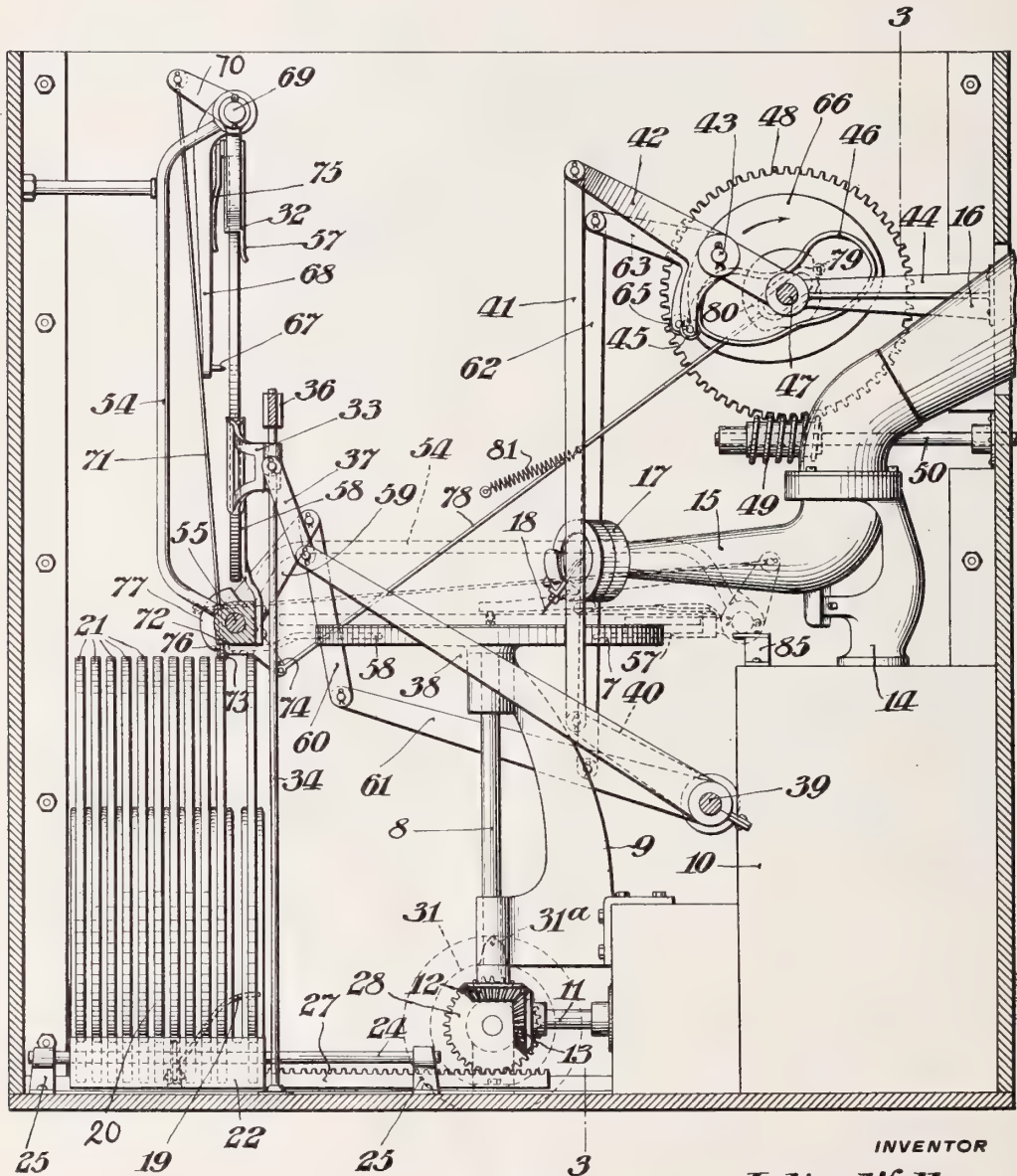
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 APPLICATION FILED JAN. 23, 1912.

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3 SHEETS—SHEET 2.

*Fig. 2.*



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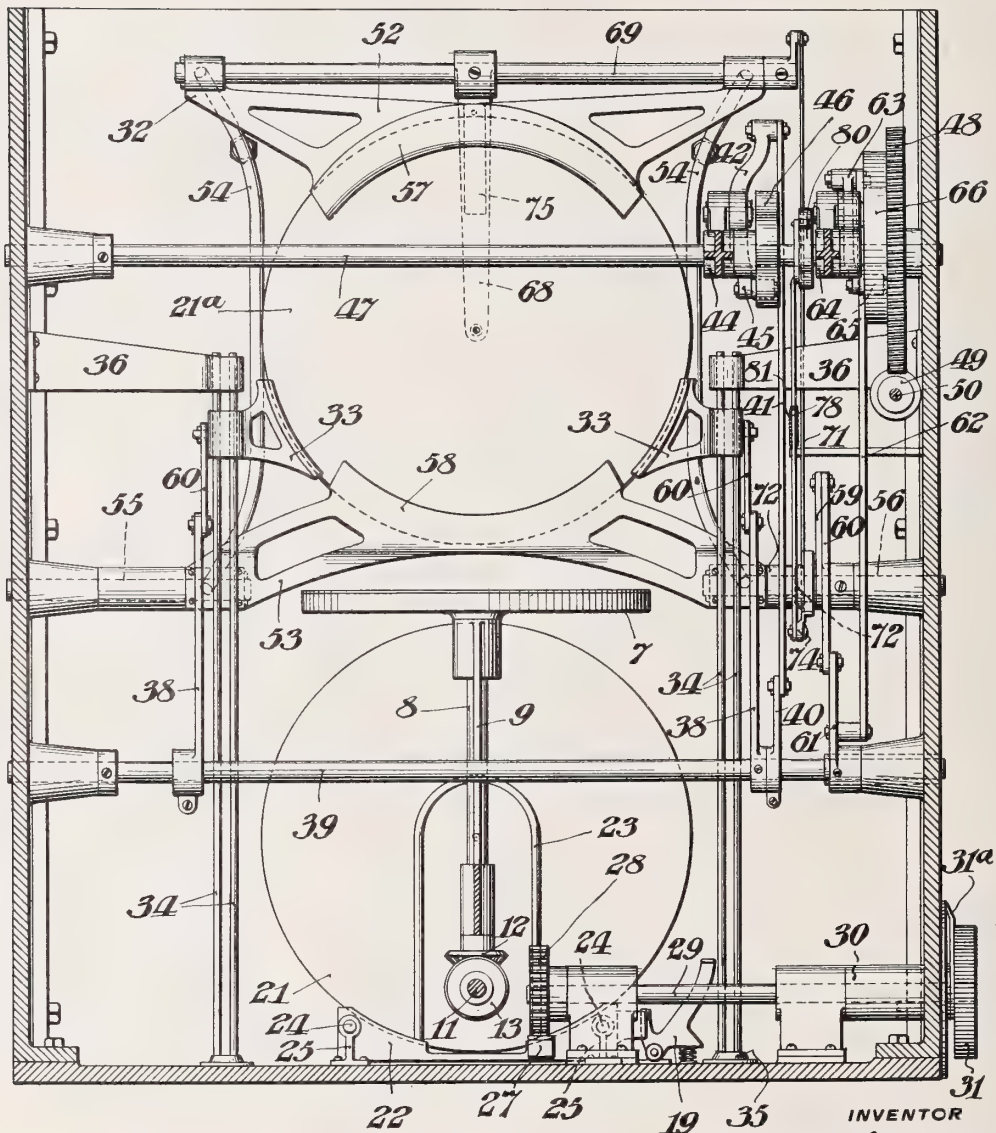
J. WELLNER.  
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 APPLICATION FILED JAN. 23, 1912.

1,032,573.

Patented July 16, 1912.

3 SHEETS—SHEET 3.

Fig. 3.



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# UNITED STATES PATENT OFFICE.

JULIUS WELLNER, OF PHILADELPHIA, PENNSYLVANIA.

RECORD-CHANGING MECHANISM FOR SOUND-REPRODUCING MACHINES.

1.032,573.

Specification of Letters Patent.

Patented July 16, 1912.

Application filed January 23, 1912. Serial No. 672,866.

*To all whom it may concern:*

Be it known that I, JULIUS WELLNER, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Record-Changing Mechanism for Sound-Reproducing Machines, of which the following is a specification.

10 This invention relates to sound-reproducing machines of the class in which are employed a series of record-disks, a magazine to support the series, a rotatable table to support and rotate a record during the reproduction thereof and mechanism to transfer record-disks from the magazine to the table, and from the table to the magazine.

15 The object of my present invention is to provide a novel, simple and efficient magazine and transfer mechanism for the record-disks, whereby the record-disks may be supported in vertical positions, or substantially so, in the series, and whereby a selected record may be first moved edge first from the series to a position away from the same and adjacent the rotatable table and then moved face first from said position to a horizontal position upon the table to be reproduced; and whereby the record, after being reproduced, may be first moved face first from the table to a position adjacent the magazine, and then returned edge first to the magazine.

25 With this object in view, the invention consists in the various novel features of construction and combinations of parts hereinafter fully described and claimed.

My invention in its broader aspect contemplates a record-disk transfer mechanism 30 employing parts which may be operated to move a record-disk face first down upon the rotatable table in transferring the record-disk from the magazine to the table irrespective of the angular relation of the record-disk to the table when the record-disk is in the magazine.

50 In the accompanying drawings, illustrating my invention: Figure 1, is a plan view of a sound-reproducing machine, embodying my invention. Fig. 2, is a vertical section,

on line 2—2 of Fig. 1. Fig. 3, is a vertical section, on line 3—3 of Fig. 2.

Referring to the drawings, 6 designates the frame or casing of a sound-reproducing machine. This frame or casing may be of any shape or size for its intended purpose. Within the casing 6 is located a horizontal, rotatable table 7 adapted to receive and support phonograph record-disks. The table 7 is carried by the upper end of a vertical shaft 8 which is journaled in a bracket 9 secured to a motor box 10 supported within the casing 6. The box 10 is adapted to contain a motor of any suitable construction, 11 designating the driving shaft of the motor extending outwardly beyond the motor box 10 to a position adjacent the lower end of the shaft 8. The shafts 8 and 11 are provided with, co-acting miter gear wheels 12 and 13, whereby the shaft 8 and table 7 may be rotated by the motor shaft 11.

Mounted upon the motor box 10 is a bracket 14 carrying an adjustable hollow arm 15 and the inner end of a horn which extends outwardly through an opening in the casing 6. The free end of the arm 15 is provided with a sound box 17 carrying the usual stylus 18 adapted to engage the grooves of a record-disk for the reproduction of the record upon the table 7 during the rotation thereof, in the usual well known manner. The arm 15 is mounted in the bracket 14 in the usual manner, to permit the arm 15 to be raised and lowered and to be moved horizontally.

85 Within the casing 6 is located a magazine 20 adapted to contain a series of record-disks and support them in parallel relation to each other, as shown. The magazine 20 comprises a horizontal frame 22 having a curved upper portion provided with grooves adapted to the lower edges of the record-disks, and upwardly extending wire loops 23 arranged between the record-disks and supporting them in vertical position and in parallel spaced relation to each other. The frame 22 is mounted to slide horizontally upon a pair of rods 24 having their ends supported by brackets 25 rising from the floor of the casing 6.



Extending from the frame 22 is a toothed rack 27 which extends parallel to the rods 24. The teeth of the rack 27 are engaged by the teeth of a gear wheel 28 secured to the inner end of a shaft 29 which is mounted to turn in a bearing 30 secured to and extending inwardly from a side wall of the casing 6. The outer end of the shaft 29 extends beyond the casing 6 and is provided with a hand-wheel 31 by means of which the shaft 29 and gear wheel 28 may be turned by hand to cause the gear wheel 28 to engage the rack 27 and thereby move the magazine 20 and the series of records carried thereby, horizontally upon the rods 24, for a purpose hereinafter explained.

Arranged above the magazine 20 and adjacent the rotatable table 7 is a frame or carrier 32 adapted to receive and carry a record-disk to the table 7, as will be hereinafter explained. The magazine 20 is adapted to be moved by the hand wheel 31 to bring a selected record into proper position beneath the carrier, after which the selected record is moved or elevated from the magazine 20 to the carrier 32 by mechanism which I shall now describe.

Arranged one on one side and one on the other side of the magazine 20 is a pair of elevators or carriers 33, each carrier 33 being mounted to slide vertically on a pair of vertical rods 34 having their lower ends supported in a bracket 35 on the floor of the casing 6 and having their upper ends supported by a bracket 36 projecting from a side wall of the casing. These carriers 33 are adapted to be moved vertically from positions beneath the sides of record-disks 21 in the magazine to carry the selected record-disk 21<sup>a</sup> edge first up from the magazine 20 to the position shown in the drawings and to lower it therefrom edge first back into the magazine.

To lock the magazine 20 against horizontal movement during the time that a record-disk is moved from and remains out of the magazine, I provide a spring pressed, pivoted latch 19 which engages one notch of a series of notches in the magazine 20 each time the carriers 33 are raised and which is moved from the engaged notch by one of the carriers 33 each time it is lowered, the notches of the series corresponding with the records in the magazine.

To raise and lower the carriers 33, I provide the following mechanism: Pivoted to the carriers 33 are the upper ends of a pair of links 37 having their lower ends pivoted to a pair of arms 38 which extend from and are fixed to a rockable shaft 39 mounted to turn in suitable bearings on the side walls of the casing 6. The shaft 39 is provided with a projecting arm 40 which is pivoted to the lower end of a link 41. The upper end of the link 41 is pivoted to a lever 42

which is fulcrumed at 43 on a bracket 44 projecting from the casing 6. The lever 42 is provided with a roller 45 bearing against a cam 46 carried by a rotatable shaft 47 journaled in the bracket 44 and in suitable bearings on the casing 6, whereby, during the rotation of the shaft 47, the carriers 33, under the influence of lever 42, will be raised and lowered by the roller following the contour of the cam 46, the roller being maintained in engagement with the cam by the weight of the movable parts connected to the lever 42.

The shaft 47 is provided with a worm wheel 48 coaxing with a worm 49 on a shaft 50 journaled in suitable bearings on the casing 6. One end of the shaft extends outwardly and is provided with a hand crank 51 by means of which the shaft 50 may be turned by hand to cause the worm gearing to rotate the shaft 47.

The frame or carrier 32 comprises upper and lower horizontal parts 52 and 53, respectively, and curved vertical rods 54 connecting the ends of the parts 52 and 53. The ends of the lower part 53 are secured to outwardly extending shafts 55 and 56 arranged in alinement with each other and mounted to turn in suitable bearings in the casing 6, thereby pivoting the lower end of the frame or carrier 32 to the casing 6 in a manner to permit the carrier to swing on its pivot from the vertical position, shown by full lines to the horizontal position shown by dotted lines in Fig. 2. The parts 52 and 53 of the carrier 32 are provided with flat curved portions 57 and 58, respectively, which are adapted to engage the back of the upper and lower portions of the record 21<sup>a</sup> held in the raised position by the carriers 33. The parts 57 and 58 are also adapted to embrace the rotatable table 7 and lie below the upper face thereof when the carrier 32 is in the horizontal or dotted line position, shown in Fig. 2.

To swing the frame 32 on its pivot to raise and lower it to the full line and dotted line positions, I provide the following mechanism: Fixed to and extending from the pivot shaft 56 is an arm 59 which is pivoted to the upper end of a link 60. The lower end of the link 60 is pivoted to an arm 61 extending from and mounted to turn freely on the shaft 39. The arm 61 is pivoted to the lower end of a link 62 having its upper end pivoted to a lever 63 which is fulcrumed on a bracket 64 projecting from the casing 6. The lever 63 is provided with a roller 65 bearing against a cam 66 carried by the shaft 47, whereby, during the rotation of the shaft 47, the carrier 32 will be swung on its pivot and raised and lowered, under the influence of the cam 66, the roller following the contour of the cam and being maintained in engagement with the cam by

the weight of the movable parts connected to the lever 63. When the carrier 32 is in the down position, shown by dotted lines, it is supported by brackets 85 projecting  
 5 from the motor box 10 and engaging the shaft 69. After a record-disk is raised from the magazine 20 to the carrier 32, the carriers 33 descend, and prior to the descent of the carriers 33, a pin 67 enters the hole in  
 10 the center of the raised record-disk to maintain it in the raised position. The pin 67 projects from the lower end of an arm 68 which extends downwardly from a horizontal shaft 69 mounted to turn in the top  
 15 part 52 of the carrier 32. By rocking the shaft 69, the pin 67 may be moved into and from the hole in the adjacent record-disk. To operate the shaft 69, I provide the following mechanism: Fixed to and extending  
 20 from the shaft 69 is an arm 70 which is pivoted to the upper end of a flexible rod 71. The lower portion of the rod 71 extends through and is slidably fitted to a collar 72 secured to the shaft 56. The lower end of  
 25 the rod 71 extends below the collar 72 and is provided with a roller 73 engaging the cam face of a cam lever fulcrumed on the shaft 56 adjacent the collar 72. The pin 67 is pressed normally away from the  
 30 record-disk, and the roller 73 is maintained in engagement with the cam lever 74 by a spring having one end secured to the top part 52 of the carrier 32 and the other end pressing against the arm 68. When the  
 35 parts are in the positions shown, the roller rests within a notch 76 in the cam lever 74 and when the lower end of the lever 74 is moved upwardly, the cam shoulder formed by the notch 76 forces the roller 73 down-  
 40 wardly, thereby moving the arm 68 inwardly against the spring 75 and causing the pin 67 to enter the hole in the center of the record-disk. After the roller 73 passes from the notch 76 it rests against a curved  
 45 face 77 of the cam lever 74, the face 77 being concentric to the shaft 56 and maintaining the pin 67 within the hole in the record-disk during the lowering and raising of the carrier 32. The lower end of the lever 74  
 50 is pivoted to the lower end of a rod 78, the upper enlarged end of which is slotted and embraces the shaft 47. The upper end of the rod 78 carries a roller 79 engaging a cam 80 carried by the shaft 47, the roller  
 55 79 being maintained in engagement with the cam 80 by a suitable spring 81. During the rotation of the shaft 47 the cam 80 acts against the roller 79 to rock the cam lever to engage the roller 73 with the notch 76 and  
 60 face 77 alternately.

The operation of the machine is as follows: When the machine is at rest and the parts are in normal position, after returning a record-disk to the magazine 20, the  
 65 arm 15 is in a position slightly laterally of

the position shown to permit the free up and down movement of the carrier 32, and the carriers 33 are below the sides of the series of record-disks 21. Assuming the  
 70 parts to be in this normal position and it is desired to play or reproduce the record on one of the record-disks within the magazine 20, the hand wheel 31 is turned to move the magazine 20 until the desired record-disk is brought into position beneath the carrier  
 75 32 and into the path of travel of the carriers 33. This operation is facilitated by the wheel 31 being provided with a pointer 31<sup>a</sup> arranged to be brought into registry with suitable markings on a dial on the side  
 80 of the casing 6, the position of the pointer with respect to the markings on the dial indicating which of the record-disks of the series has been brought into the path of the carriers 33. The crank 51 is now operated by hand to turn the cam shaft 47 in the direction of the arrow in Fig. 2. During the  
 85 movement of the cam 46 it acts upon the roller 45 to elevate the carriers 33 to the positions shown, thereby causing the carriers 33 to engage the side edges of the selected record-disk below the center thereof and carry the selected record-disk edge first from  
 90 the magazine 20 to the carrier 32. Immediately following the raising of the record-disk to the carrier 32, the cam 80 operates the roller 79 to move the pin 67 into the hole in the center of the record-disk to support the same when the cam 46 permits  
 95 the carriers 33 to move down from engagement with the record-disk. This being done, the cam 66 permits the roller 65 to move toward the shaft 47 and thereby lower the carrier to the position shown by dotted lines in Fig. 2, thereby moving the record-disk face first to and depositing it upon the  
 100 table 7. When the carrier 32 is in the down position the parts 57 and 58 thereof are below the top of the table 7 and the record-disk rests upon the table 7 and is free to be rotated thereby, being held centrally thereon by the pin 67.

The operation just described of transferring a record-disk from the magazine 20 to the table 7 requires one-half of a revolution  
 105 of the cam shaft 47. The cam shaft 47 is now permitted to remain at rest and the arm 15 is raised, moved inwardly over the record-disk upon the table and lowered into engagement with the outer portion of the record groove by hand; whereupon the motor within the box 10 is started to rotate the  
 110 table 7 and the record is played or reproduced in the usual manner. After the playing of the record, the motor is stopped and the arm 15 is raised, moved laterally and lowered, after the sound box 17 has cleared the carrier 32. The crank 51 is now operated by hand to again turn the cam shaft 47  
 115 in the direction of the arrow. During the



first movement of the shaft, the cam 66 operates the roller 65 to raise the carrier 32 and therewith the record-disk face first from the table 7 to the vertical position shown by full lines. The cam 46 then raises the carriers 33 into engagement with the record-disk and the cam 80 permits the spring 81 to move the cam lever 74 to engage the notch 76 with the roller 73 and thereby permit the spring 75 to move the pin 67 from the hole in the center of the record-disk leaving it resting upon the carriers 33. Following this, the cam 46 permits the roller 45 to move toward the shaft 47 and thereby lower the carriers 33 and the record-disk edge first into the place in the magazine from which it was taken, leaving the parts of the machine in position for a succeeding operation. The returning of the record-disk from the table 7 to the magazine 20 requires one-half of a revolution of the cam shaft 47. It will, therefore, be seen that each time the shaft 47 is turned a complete revolution, a record-disk will be taken from the magazine 20, placed upon the table 7 and returned to the magazine.

I desire it to be understood that my invention is not confined to a hand operated machine. The record changing mechanism may be operated by hand, as described; and when the invention is used in connection with a machine in which it is desired to change the records automatically, either the shaft 50 or the shaft 47 may be operated by any suitable automatic mechanism.

When herein I speak of "edge first" I mean in a direction parallel to the flat faces of a record-disk; and when herein I speak of "face first" I mean in a direction leading out from one of the flat faces of a record-disk substantially at right angles thereto.

I claim:

1. In a sound-reproducing machine, the combination of a rotatable table, means for supporting a record-disk in substantially a vertical position, means operative to move a record-disk edge first to a position away from the first named means, and means operative to move a record-disk from said position to a horizontal position upon the table.

2. In a sound-reproducing machine, the combination of a rotatable table, means for supporting a record-disk in substantially a vertical position, means operative to move a record-disk from the top of the table and into substantially a vertical position, and means operative to move a record-disk from the last named position to the first named means.

3. In a sound reproducing machine, the combination of a rotatable table, means for supporting a series of record-disks, a record-disk carrier, a second record-disk carrier,

and a common operating part for said carriers, said part being provided with means to operate the first named carrier to move a record disk edge-first from the series to the second named carrier and said part being provided with means to operate the second named carrier to move a record-disk face first to the turn table in prescribed order.

4. In a sound-reproducing machine, the combination of a rotatable table, means for supporting a series of record-disks, a record-disk carrier, a pivoted record-disk carrier, and a common operating part for said carriers, said part being provided with means to operate the first named carrier to move a record-disk edge first from the series to the second named carrier and said part being provided with means to operate the second named carrier to move a record-disk face first to the turn table in prescribed order.

5. In a sound-reproducing machine, the combination of a rotatable table, means for supporting record-disks in a series and in substantially vertical positions, a record-disk carrier, a second record-disk carrier, and a common operating part for said carriers, said part being provided with means to operate the first named carrier to move a record-disk edge first from the series to the second named carrier and said part being provided with means to operate the second named carrier to move a record-disk face first to the turn table in prescribed order.

6. In a sound-reproducing machine, the combination of a rotatable table, means for supporting record-disks in a series and in substantially vertical positions, a record-disk carrier, a pivoted record-disk carrier, and a common operating part for said carriers, said part being provided with means to operate the first named carrier to move a record-disk edge first from the series to the second named carrier and said part being provided with means to operate the second named carrier to move a record-disk face first to the turn table in prescribed order.

7. In a sound-reproducing machine, the combination of a rotatable table, means for supporting a series of record-disks, a record-disk carrier, a second record-disk carrier provided with means to receive and support a record-disk, and a common operating part for said carriers, said part being provided with means to operate the first named carrier to move a record-disk face first from the table to the second named carrier and said part being provided with means to operate the second named carrier to move a record-disk edge first to the series.

8. In a sound-reproducing machine, the combination of a rotatable table, means for supporting record-disks in a series and in substantially vertical positions, a pivoted record-disk carrier, a second record-disk car-

rier, and a common operating part for said  
carriers, said part being provided with means  
to operate the first named carrier to move a  
record-disk face first from the table to the  
5 second named carrier and said part being  
provided with means to operate the second  
named carrier to move a record-disk edge  
first to the series.

In testimony whereof I affix my signature  
in presence of two witnesses.

JULIUS WELLNER.

Witnesses:

S. I. HARPER,  
A. V. GROUPE.

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Washington, D. C."

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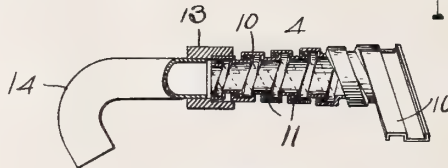
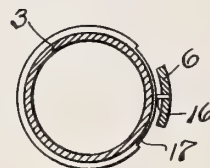
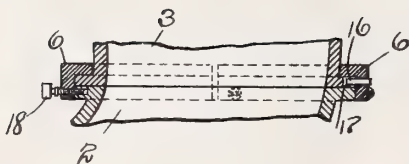
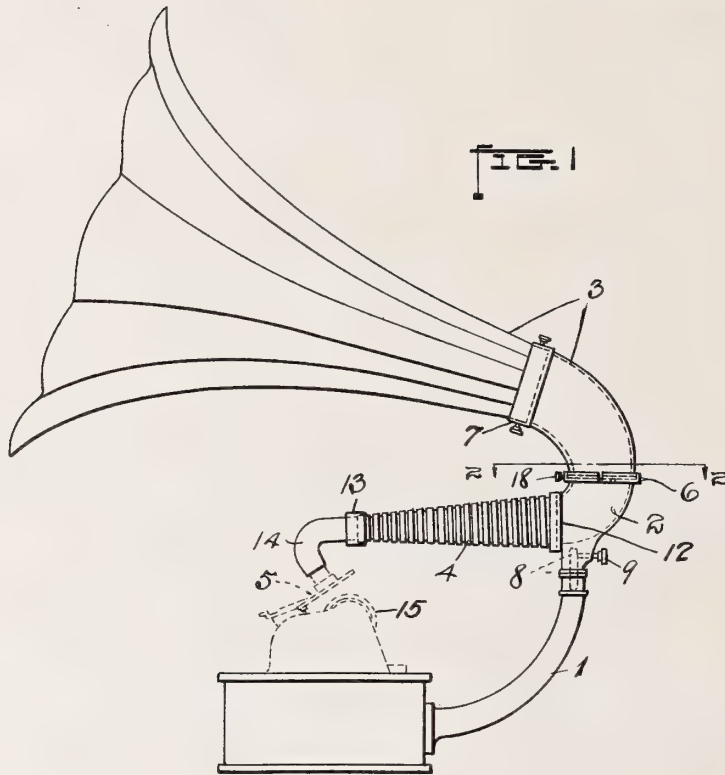




T. H. TOWELL.  
HORN FOR TALKING MACHINES.  
APPLICATION FILED MAR. 18, 1912.

1,033,215.

Patented July 23, 1912.



WITNESSES=

Oliver M. Kappeler.

Jno. F. O'Brien

FIG. 4

INVENTOR

Thomas H. Towell

BY J. B. Fay  
ATTORNEY

# UNITED STATES PATENT OFFICE.

THOMAS H. TOWELL, OF CLEVELAND, OHIO, ASSIGNOR TO THE UNITED STATES  
PHONOGRAPH COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

## HORN FOR TALKING-MACHINES.

1,033,215.

Specification of Letters Patent.

Patented July 23, 1912.

Original application filed July 29, 1910, Serial No. 574,467. Divided and this application filed March 18,  
1912. Serial No. 684,443.

*To all whom it may concern:*

Be it known that I, THOMAS H. TOWELL, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Horns for Talking-Machines, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The present invention, relating as indicated to horns for talking machines, has as its object the provision of a horn suitable for use on such machines, whether of the disk or cylinder type, and one that will be readily adjustable to the various requirements encountered in operating either such type of machine.

The subject matter of the present case has been divided out of applicant's co-pending application Serial No. 574,467, filed July 29, 1910, and relates more especially to the amplifier as distinguished from such amplifier in combination with the talking machine mechanism.

To the accomplishment of the end just recited said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawing:—Figure 1 is a side elevation of one typical form of cylinder talking machine, with a horn shown in connection therewith embodying the present improvement; Fig. 2 is a horizontal sectional detail of such horn, taken on the plane 2—2, Fig. 1; Fig. 3 is a vertical section of a detail of the jointed elbow connecting the tone arm with the amplifier proper; and Fig. 4 is similarly a vertical section of the forward end of said tone arm, the pitch of the coiled interlocking strip composing such tone arm being exaggerated in order to render the construction of the latter clear.

Only the outline of the talking machine proper, together with the case or cabinet upon which it is mounted, is shown in Fig.

1, and it will be understood that the type of the machine is entirely immaterial so far as the improvements herein claimed are concerned. In other words, for example, said machine may be of the disk record type instead of the cylinder type illustrated.

The horn is designed to be supported upon a bracket 1 extending rearwardly and upwardly from such cabinet, and comprises in effect three portions, a tubular elbow 2 pivotally mounted upon the bracket in question about a vertical axis, an amplifying horn 3, and an extension 4 that forms the sound-conveying connection between the small end of said amplifier and the sound-box 5 of the talking machine. The openings of such tubular elbow are substantially right-angularly related, and it is with the upwardly directed one that the amplifying horn is connected, being pivotally secured to the elbow by a sectional flange 6, as clearly shown in Fig. 3. One section of such flange is detachably secured in place by a set-screw 18, whereby the horn may be entirely removed from the elbow. Said horn is furthermore constructed in one or more sections which may be separated, as at the joint 7, if desired, to facilitate packing in case of shipment or storage, the horn being more or less in the way when not in use. Pivotal movement of horn 3 upon the bracket is limited in either direction by a stop 16 carried by the other section of such flange and coöperating with a segmental notch or recess 17 in the edge of the horn, as will be readily understood. The elbow 2 is thus pivotally mounted about an upwardly directed pin or stud 8 on the bracket 1, and is designed to be normally fixedly secured, or in other words, held against rotation, by means of a set-screw 9, that coöperates with such pin. It is not designed that such elbow shall have any movement about this pin in the normal use of the horn, such pivoting being merely provided in order to enable the horn to be swung to one side, in case it becomes desirable to entirely disconnect the same from the sound-box.

The sound conveyer 4 extending from the small end of the horn 3, or rather from the horizontally directed opening of the elbow 2, to the sound-box comprises a section of flexible metallic tubing, a preferred con-



structional form of such tubing being that shown in the sectional view of Fig. 4, from which it will be seen to consist of coiled interlocking strips 10 of metal, with an interposed packing strip 11. Such sound-conveyer is furthermore made tapering to conform with the taper of the amplifying horn and elbow so that, in other words, there is a continuous and general increase in the diameter of the bore of the passage formed by such extension, elbow and the amplifier proper.

The larger end of the conveyer is received in an annular socket or recess 12 formed in the casting constituting the elbow, while a ferrule or sleeve 13 is similarly fitted over the smaller end of such conveyer, one end of the short recurved tube, or elbow 14, that connects the sound conveyer with the sound-box being designed to slidably fit within such sleeve, just as the other end of such tube 14, fits slidably over the upwardly extending tubular portion of the sound-box 5.

The flexible character of the sound-conveyer permits the sound-box to travel across the record upon the record support 15 with perfect freedom, while still preserving a direct connection with the amplifier. The bore, moreover, of such conveyer, increases gradually in diameter in accordance with the well known principle of acoustics, so that the sounds emanating from the sound-box are reproduced in perfect tone and undiminished volume. The horn proper may obviously be swung so as to extend in any desired direction without interfering in the slightest with the flexing of the sound conveyer although the stop 16 prevents any turning of the horn to an extent that might overbalance the machine. When it is desired to remove the horn this is readily accomplished by releasing the set-screw 18 that holds the detachable section of the retaining flange in place. Should it, furthermore,

become necessary or desirable to entirely disconnect the sound conveyer from the sound-box in order to get at the machine, this may be accomplished by simply loosening set-screw 9, when the elbow, together with the sound conveyer and amplifier attached thereto, may be swung to one side.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. A horn for talking machines, comprising a generally tapering amplifying horn proper, and a flexible tubular extension to the smaller end of said horn consisting of coiled interlocking strips, such extension being tapered to conform with the taper of said amplifying horn.

2. A horn for talking machines, comprising a generally tapering amplifying horn proper, and a flexible tubular extension to the smaller end of said horn consisting of coiled interlocking strips of metal, such extension being tapered to conform with the taper of said amplifying horn.

3. A horn for talking machines, comprising a curved amplifying horn proper of generally tapering form pivotally supported at its smaller end, and a flexible tubular extension to such smaller end consisting of coiled interlocking strips of metal, such extension being tapered to conform with the taper of said amplifying horn.

Signed by me this 14th day of March, 1912.

THOMAS H. TOWELL.

Attested by—

ANNA L. GILL,

JNO. F. OBERLIN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."



J. W. OWEN.  
METHOD OF MAKING SOUND RECORDS.  
APPLICATION FILED JULY 30, 1909.

1,033,909.

Patented July 30, 1912.

Fig. 1.

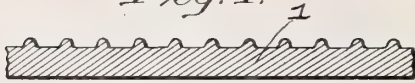


Fig. 4.

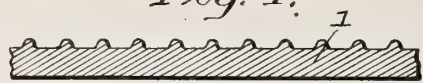


Fig. 2.

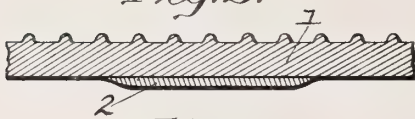


Fig. 5.

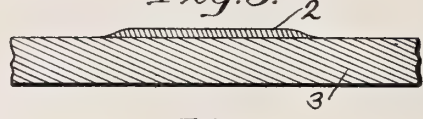


Fig. 3.

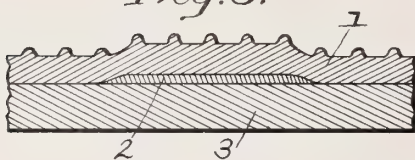


Fig. 6.

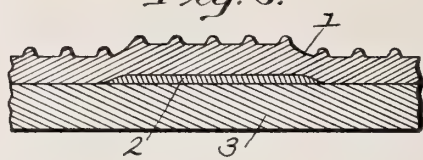


Fig. 7.



Fig. 8.

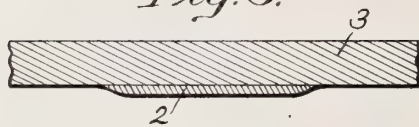


Fig. 9.

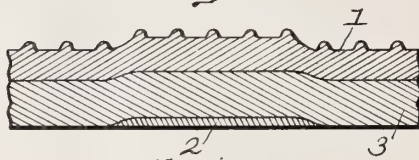


Fig. 10.

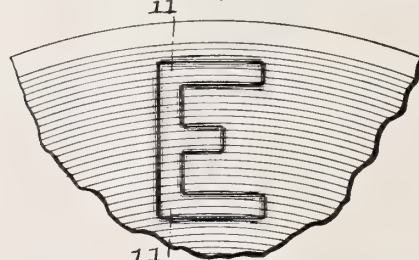


Fig. 11.



WITNESSES

W. G. Hartmann.

Alexander B. Moulton

BY

James W. Owen.

ATTORNEY



# UNITED STATES PATENT OFFICE.

JAMES W. OWEN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

## METHOD OF MAKING SOUND-RECORDS.

1,033,909.

Specification of Letters Patent.

Patented July 30, 1912.

Original application filed May 4, 1908, Serial No. 430,657. Divided and this application filed July 30, 1909. Serial No. 510,408.

*To all whom it may concern:*

Be it known that I, JAMES W. OWEN, a citizen of the United States, and a resident of the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a certain new and useful Method of Making Sound-Records, of which the following is a full, clear, and exact disclosure, reference being had to the accompanying drawings, forming part of this specification.

The main object of this invention is to provide an improved method whereby a matrix or a record of sound may be produced, so marked for identification that duplicates thereof cannot be formed or "dubbed" from it without incorporating into such duplicates the identification marks of the original, this application being a division of my prior application, Serial No. 430,657, filed May 4, 1908, upon which issued United States Letters Patent No. 964,686, dated July 19, 1910.

This method is preferably utilized to form an identification mark or marks within the recorded surface of the record, the term "recorded surface" being used to define the whole or any part of the surface of the undulatory sound groove or ridge of a record or of the surface between the turns of such groove or ridge. Preference is given to an identification mark or marks such as a word or words, or characters of any description, that will indicate the origin of the record or that will give any other information desired.

In the drawings forming a part of this application, in which the same reference characters are used to designate like parts throughout the various views, Figures 1 to 3 illustrate one method of forming identification marks in a sound record matrix; Figs. 4, 5 and 6 show a modified manner of carrying out the said method; Figs. 7, 8 and 9 show a still further modified process of marking a sound record matrix; Fig. 10 is a fragmental plan view and Fig. 11 a fragmentary sectional view of a sound record tablet having identification marks formed in the recorded surface thereof.

In the application of this method, a master record is first formed in any of the ordinary ways, such as by cutting or engraving a soft record blank with a stylus actuated by sound waves, and a matrix 1 is then

formed from the master record in any usual manner, for instance by electro-plating the master record with copper and then stripping the copper deposit therefrom, the stripped deposit constituting the matrix. Having thus formed a matrix in the usual manner, a negative of the distinguishing mark or marks to be applied to the record is then formed in the matrix. The forming of the distinguishing mark in the matrix may be accomplished in various ways, some of which are as follows:—

Referring first to the process illustrated in Figs. 1 to 3 of the drawings, a matrix 1 is provided on its back with the mark which it is desired to have appear upon the face of the finished record and in the face of the record formed therefrom. This mark may be formed by depositing upon the back of the matrix a thin layer or deposit 2 of metal, such as copper or zinc. This layer or deposit should have the contour of the mark ultimately to be produced. I may, however, form the mark by coating the entire back of the matrix with thin layer of metal, and then removing portions of the deposited metal with a suitable agent, the action of which is to dissolve or eat away portions of the layer leaving parts standing out in relief on the back of the matrix. Having thus formed the mark on the back of the matrix by elevating and depressing portions of the surface thereof, so that parts of the back are out of the plane of the surrounding surface of the back of the matrix, the matrix may then be united to a suitable backing by any well known manner as by a sweating process, that is to say, a soldering of the matrix to the backing under high pressure. In doing this a sheet of any suitable elastic material such as asbestos should be placed over the face of the matrix in order to prevent the press from injuring the record of sound.

In thus uniting the matrix to the backing under pressure, the mark, formed on the back of the matrix will be pressed through to the face of the matrix and will plainly appear upon the face of the finished matrix, either as an elevation or depression of a predetermined contour, the contour being that of the deposit on the back of the matrix and the mark being raised or depressed depending upon whether the figure or mark be raised upon the backing, or the surface



around the mark be raised above the plane of the surface of the mark itself. Preferably the edges of the mark should be beveled so that the stylus in running from the elevation or depression caused by the mark, will not produce an undesirable sound during the reproduction of the sound of the record. To this end, the deposit formed on the back of the matrix should also be provided with beveled edges, that is, with surfaces slowly running into the surface surrounding the mark.

In carrying out this process, it will be observed that the mark formed on the back of the matrix is forced or impressed into the recorded surface of the matrix, and appears upon the face thereof by reason of the pressure used in uniting the matrix to the backing, the elastic cushion on the face of the record allowing portions of the matrix to be permanently bent or flexed or forced into a plane different from the plane of the surrounding surface, and when so bent, said surface will permanently remain in such bent condition. It is not necessary, however, that the mark be forced into the surface during the process of uniting the matrix to the backing, inasmuch as it is obvious that the part which I have designated as the backing 3 need not be such a backing as is permanently united to the matrix, that is to say, the backing may merely be to force the mark formed on the back of the matrix through to the face of the matrix, so that it appears on the face of the matrix as an elevation or depression. It is, however, very convenient to mark the record during the process by which it is united to the backing.

In Figs. 4 to 6, a modification of the above process is shown, the process differing only in that the thin layer of material constituting the mark 2 or the surface around the mark is formed on the face of the backing instead of on the back of the matrix. When so formed and united as above described, a similar result will be produced, namely, the mark which was formed on the face of the backing will be forced into and through the matrix, and will appear on the face of the matrix. In this modification, also the part which has been designated as the backing 3 may be in reality a die having elevated or depressed portions in its surface, whereby the mark may be forced or impressed into the matrix and the matrix may be united to any other suitable backing.

In Figs. 7 to 9 the thin layer or deposit forming the mark is formed on the back of the backing, and when the matrix and the backing are united under pressure, the mark will be impressed through the backing and through the matrix; and it will appear on the face of the matrix.

In all these methods above described, it

will be observed that the depth of the groove itself is not to be changed. The grooved surface will merely be slightly displaced sufficiently to form a mark visible to the eye, in the highly polished surface of the matrix, but the elevation of the mark will be slight and the edges of the mark should be preferably beveled into the surrounding surface, so that no sound will be produced in the finished record, formed from the matrix, when the stylus traverses the elevation or depression.

In Fig. 10, I have shown a letter as constituting a mark impressed into the recorded surface of the matrix and showing on the face of the matrix as a slight elevation, and Fig. 11 is a section on the line 11—11 of Fig. 10, showing how the mark would be depressed into the recorded surface of a commercial record.

In carrying out my process, it will be observed that the mark may be formed in other ways than those which have been described. A thin separate sheet or piece of material may be loosely interposed between the matrix and the adjacent surface of the backing and retained there when the matrix and backing are united. The mark may be formed by painting a desired mark upon either of the adjacent surfaces of the matrix or backing, or upon the back of the backing, and the same result would be accomplished in the finished matrix.

In carrying out my invention, I preferably locate the mark in the matrix so that it will appear in the recorded surface of the record, so as to make it practically impossible to duplicate or dub the record without incorporating into the duplicate the mark formed in the original record and matrix, although the mark may be formed in the matrix or finished record in other places than in the recorded surface.

It is obvious that by any of these methods the mark may be produced as a depression in the face of the record instead of as a projection by forming the deposit over all of the back of the matrix or over all of the front of the backing except an area corresponding to the mark, instead of over the area of the mark, and then uniting the backing to the matrix as heretofore.

It is also obvious that instead of an electro-deposit upon the back of the matrix or upon the face of the backing, any other means may be used to produce a thickness of material, or a depression, corresponding in contour to the mark desired, between the matrix and the backing, or between the matrix and any means of applying pressure thereto; or the mark might be produced in relief or as a depression in the face of the matrix by the pressure of a die upon the back of the matrix, the face of the matrix being protected from injury by a layer of

yielding material, as heretofore described, or in any other suitable manner.

The matrices formed as above described are preferably plated with nickel to give a smooth finish and to protect the same from corrosion.

Commercial sound records are formed in the usual manner from the matrices thus produced and the distinguishing mark upon the face of the matrix is obviously reproduced in the face of the record. The mark is so proportioned as to make only a slight displacement of the normal recorded surface of the record and has no appreciable phonetic effect in the reproduction of sound from the record, as heretofore explained, but the mark is clearly visible to the ordinary observer.

While I have described a number of ways in which this invention may be practised, I do not limit myself to any one of the exact ways above described, since various changes might be made in the application of the method within the spirit of the invention and the scope of the appended claims.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:

1. The method of marking a record of sound, which consists in forcing portions of the recorded surface out of the plane of the adjacent portions of the recorded surface.

2. The method of marking a matrix of a record of sound which consists in permanently bending portions of the recorded surface out of the plane of the adjacent portions of the recorded surface.

3. The method of marking a record of sound which consists in impressing a mark having a predetermined configuration in the recorded surface of the matrix.

4. The method of marking a matrix of a record of sound which consists in pressing said matrix against a backing, one of the adjacent surfaces of said matrix and backing having a portion in a plane different from the plane of the adjacent portions.

5. The method of marking a matrix, of a record of sound, which consists in forming the desired marks on one of the adjacent surfaces of the matrix and backing, and uniting said matrix and backing under pressure.

6. The method of marking a matrix for sound records, which consists in applying a backing to said matrix and simultaneously displacing a portion of the face of said matrix.

7. The method of marking a matrix for sound records which consists in placing a

thickness of material on a part of the back of said matrix and securing a backing to said matrix under pressure.

8. The method of marking a matrix for sound records, which consists in interposing a thickness of material corresponding in contour to the mark desired between said matrix and the backing and opposite to the recorded surface of said matrix, and securing the backing to said matrix under pressure.

9. The method of marking a matrix for sound records, which comprises electroplating a portion of the back of said matrix and then pressing said electroplated portion into said matrix to produce a mark upon the face of the matrix.

10. The method of marking a matrix for sound records, which comprises electroplating a portion of the back of said matrix opposite the recorded surface thereof, and then pressing said electroplated portion into said matrix to produce a mark upon the face of the matrix.

11. The method of marking a matrix for sound records, which comprises applying a yielding cushion to the face of the matrix and a rigid backing to the back of the matrix, interposing a thickness of material corresponding in contour to the mark desired between the matrix and said backing, and applying force to said backing.

12. The method of marking a matrix for sound records, which comprises applying a yielding cushion to the face of said matrix and sweating a backing to the back of said matrix under pressure, a thickness of material corresponding in contour to the mark desired having been interposed between said matrix and said backing.

13. The method of marking a matrix for sound records, which comprises applying a yielding cushion to the face of said matrix and sweating a backing to the back of said matrix under pressure, a thickness of material corresponding in contour to the mark desired having been interposed between said matrix and said backing and opposite the recorded surface of said matrix.

14. The method of marking a matrix for sound records, which comprises making a deposit on one of the adjacent surfaces of the backing and the matrix, said deposit having a tapered edge, and applying pressure to said deposit to displace a portion of the face of said matrix.

In witness whereof, I have hereunto set my hand this 29th day of July, 1909.

JAMES W. OWEN.

Witnesses:

RALPH L. FREEMAN.

FRANK B. MIDDLETON, Jr.





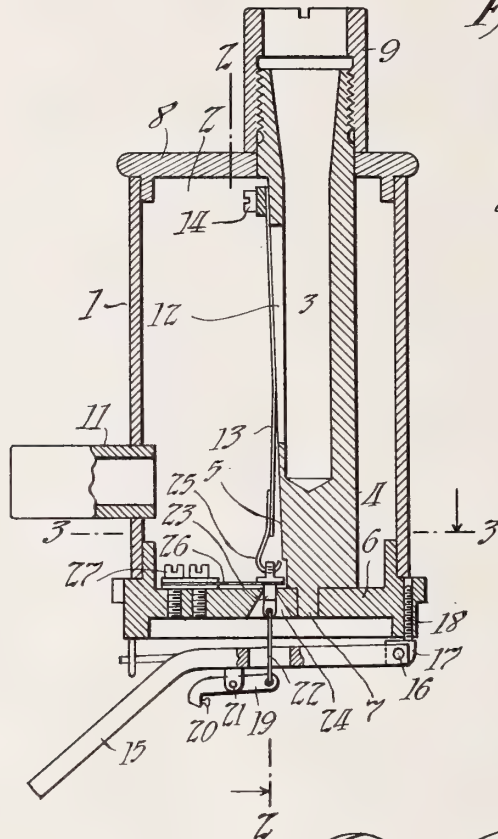


D. HIGHAM.  
SOUND REPRODUCER.  
APPLICATION FILED DEC. 15, 1909.

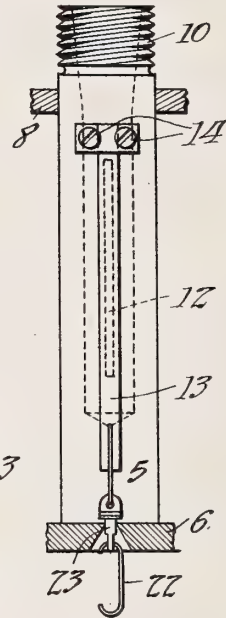
1,034,014.

Patented July 30, 1912.

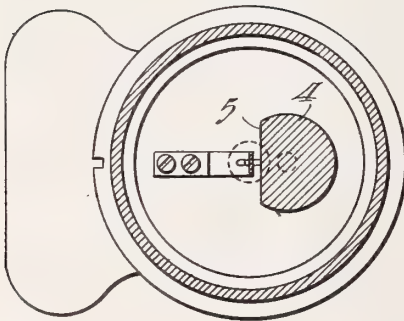
*Fig. 1*



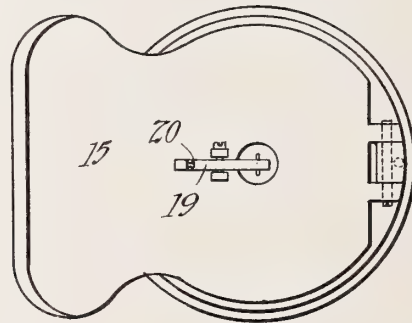
*Fig. 2*



*Fig. 3*



*Fig. 4*



*Witnesses:*  
Frank D. Lewis  
Dyer Smith

*Inventor:*  
Daniel Higham  
by Frank L. Dyer  
his Atty.

# UNITED STATES PATENT OFFICE.

DANIEL HIGHAM, OF NEW YORK, N. Y.

SOUND-REPRODUCER.

1,034,014.

Specification of Letters Patent.

Patented July 30, 1912.

Application filed December 15, 1909. Serial No. 533,265.

*To all whom it may concern:*

Be it known that I, DANIEL HIGHAM, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Sound-Rep-  
roducers, of which the following is a description.

My invention relates to phonograph reproducers of the pneumatic type, or, generally speaking, of the type in which undulations corresponding to sound waves are impressed upon a current of any suitable moving fluid by the operation of a suitable valve through which the fluid is allowed or caused to pass, the valve being operated in accordance with the sound waves as by connection with a reproducing stylus tracking a record groove.

The objects of my invention are the construction of a sound reproducer whose tones will be characterized by more perfect quality than those of reproducers ordinarily used, and which will cause undulations corresponding to the original sound waves, but greatly amplified thereover, to be impressed upon the current of air or other moving fluid passing through the reproducer with the result that tones of much greater volume may be reproduced than is commonly possible in devices of this character.

My invention operates upon a new principle by which the movement imparted to the valve member by connection with the stylus lever is greatly amplified in the vibration of the valve member. This is accomplished by forming a valve of flexible material which is seated upon a port connecting two communicating chambers, or is otherwise suspended across the path taken by the moving fluid in its passage through the sound box, this valve normally being bent in an arc of slight curvature. The valve member is fixed at one end and is connected to the reproducing stylus at its other or free end in such a manner that the reciprocating motion derived from the movement of the stylus in traveling over the record groove is communicated to the free end of the valve member by alternate pushes and pulls lengthwise of the valve member or substantially parallel to the valve plate upon which it is seated. The longitudinal movements thus imparted to the free end of the valve member result in a corresponding, but greatly amplified, movement of that portion of the member

which is seated upon the port toward and away from the port as the curvature of the member increases and decreases. The movement of the center of the flexible member as it vibrates at right angles to its length may easily amount to seven or eight times the movement imparted longitudinally of the valve member by connection with the stylus where the arc of the flexible member is quite flat. I have also constructed the sound box in a novel manner, one chamber being formed within a member which extends within the other chamber, somewhat in the form of a pipe of smaller diameter than the first named chamber, this member or pipe being provided with a port upon which the flexible valve is seated. This construction need not necessarily be used, however, in connection with the valve connections just described.

In view of the foregoing, my invention consists in the features hereinafter described and claimed.

Reference is hereby made to the accompanying drawings, forming part of this specification and embodying one form of my invention, and in which—

Figure 1 represents a vertical cross section through a reproducer embodying my invention, certain parts being shown in side elevation. Fig. 2 is a view of my improved valve and the member containing the port upon which it is seated taken on line 2—2 of Fig. 1. Fig. 3 is a horizontal section taken on line 3—3 of Fig. 1. Fig. 4 is a bottom plan view of the device shown in Fig. 1.

The same reference numerals will be used in all of the above figures to denote corresponding parts.

Referring to the drawings, the sound box 1 is provided as is common with two interior chambers 2 and 3. I prefer, however, to form these chambers in a novel manner, although it is not essential to my main invention that they be so formed. As shown in the drawings, the chamber 3 is formed longitudinally in the elongated member 4 which is secured within sound box 1 so that it extends through the whole interior of chamber 2 of sound box 1. Member 4 may conveniently be in the form of a cylinder having a flattened portion 5 on one side thereof to constitute a valve seat. The lower end of this cylinder 4 may conveniently be secured to the bottom 6 of sound box 1 by a



mortise and tenon joint, as shown at 7. This joint is made sufficiently tight to hold member 4 securely in place. The top 8 of sound box 1 is then placed in position with member 4 extending therethrough and a cylindrical member 9 screw threaded on its bore is screwed upon the threaded periphery 10 of the upper cylindrical portion of member 4 above top member 8 to secure the parts firmly in position. The chamber or passageway 3 extends downwardly through member 4 a considerable distance within the interior of the sound box, and this chamber 3 communicates through member 9 with any suitable horn or sound amplifying means. The pipe connection 11 is provided with an opening into chamber 2 of sound box 1, preferably at right angles to the surface 5 of member 4 for the introduction of a continuous current of air or other suitable fluid into the sound box. A port 12 preferably in the form of an elongated vertical slit is provided in the surface 5 of member 4, this port thus connecting chambers 2 and 3. The valve 13 formed of any suitable thin elastic material is seated upon port 12 and is secured to member 4 by any suitable means as screws 14 immediately above the upper end of the port. It is, of course, obvious that a plurality of such ports and valves might be provided if desired.

By forming chamber 3 in a member as described, a simple and compact device is provided which also has the advantage that chamber 2 surrounding member 4 in which chamber 3 is situated, constitutes a reservoir or equalizing means for the pressure of the air or other moving fluid entering through pipe 11.

Valve member 13 is seated upon port 12 and is curved or bent inwardly therefrom in an arc of slight curvature, so that the lower end of the valve member below the port 12 juts forwardly a slight distance from surface 5 of member 4. Floating weight 15 is pivoted at 16 to block 17 which is pivoted within bottom member 6 of sound box 1 in the well known manner, as indicated by screw 18. Stylus lever 19 bearing stylus 20 is pivotally connected to floating weight 15 in any convenient manner as indicated at 21. Link 22 extends upwardly from the tail of stylus lever 19 through a suitable opening in floating weight 15 and is connected at its upper end to a link or rod 23 vertically in line therewith, which link is adapted to reciprocate in a vertical plane through an opening 24 in bottom plate 6 of the sound box 1, in which opening link 23 is closely fitted to slide. The upper end of rod 23 is provided with a hole threethrough through which is passed a hook 25 which is secured to the lower end of valve member 13 as shown. Oo, link 24 may be connected to valve 13 in any other suitable manner. Horizontal spring

26 is preferably provided, being mounted on the upper surface of bottom plate 6 of the sound box as by screws 27, the free end of this spring being connected to rod 23 to regulate the amount of curvature of valve 13 and the tension under which it is held. As stylus 20 rises and falls in following the vertical undulations of the sound groove of the record being reproduced, link 22 and rod 23 reciprocate in a plane substantially parallel to the face 5 of the valve seat, or in a plane which may be considered as being tangential to the curvature of valve 13 at the port opening. The alternate up and down movement thus communicated to the lower end of valve 13 flexes the latter, the downward movement of rod 23 straightening out valve 13 or decreasing the curvature thereof, while upward movement of member 23 increases the curvature of the valve. Thus, the downward movement of rod 23 moves the valve member from its port, while upward movement of rod 23 causes the valve to be seated more firmly upon its port, thus reducing the port opening. Where the valve member is curved in a very slight arc, as shown in the drawings, the movement lengthwise of the valve member communicated from the stylus results in a movement of the center of the arc at right angles to the movement of link 23 much greater than the movement of link 23. In a construction such as that shown in the drawings, the movement of the valve toward and away from the port resulting in a decrease and increase of the extent of port opening, easily amounts to seven or eight times the amount of movement parallel to the valve causing such movement of the valve. The result of this construction is that sound undulations corresponding to the vibrations of the stylus in reproducing, but very greatly amplified in character are impressed upon the current of air or other fluid passing through the sound box with consequent amplification of the sound reproduced.

It is obvious that my invention is not limited to the exact construction shown, but is as broad as is indicated by the appended claims. My invention is based upon a principle of amplification which is apparently broadly new in the art.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. In a sound reproducer, the combination with a plate having a port there-through, of a flexible member seated upon said port and secured at one end to said plate adjacent the end of said port, the end of said member being curved away from the surface of said plate, and means for causing said free end to move lengthwise approximately parallel to said plate in accordance with sound vibrations to vary the extent of

opening of said port correspondingly, substantially as described.

2. In a sound reproducer, the combination with a plate having a port therethrough, of  
5 a flexible member seated upon said port and secured at one end to said plate adjacent the end of said port, the end of said member being curved away from the surface of said plate in an arc, and means for communicating  
10 movement in accordance with sound vibrations to the free end of said member lengthwise of the same to vary the extent of opening of said port correspondingly, substantially as described.

3. In a sound reproducer, the combination with a plate having a port therethrough, of a flexible member covering said port and secured at one end to said plate adjacent one  
15 end of said port, said member being bent into the form of a flat arc, and means for reciprocating the free end of said member in accordance with sound vibrations in the direction of a tangent to said arc to increase  
20 and decrease the amount of curvature of the member to vary the extent of opening of said port correspondingly, substantially as described.

4. In a sound reproducer, the combination of a hollow body having two chambers communicating through a port, a flexible member  
30 seated upon said port, anchored at one end, and slightly curved away from the plane containing the mouth of said port at its other end, a link secured to the free  
35 end of said member and extending in a plane substantially parallel to that containing the mouth of said port, and means for reciprocating said link in accordance with sound vibrations to vary the extent of opening  
40 of said port correspondingly, substantially as described.

5. In a sound reproducer, the combination with a plate having a port therethrough, of a flexible member covering said  
45 port and secured at one end to said plate adjacent one end of said port, said member being bent into the form of a flat arc, and means for communicating movement in accordance with sound vibrations to the free  
50 end of said member in a direction to exert alternate pushes and pulls lengthwise of the same to increase and decrease the amount of curvature of the member correspondingly, substantially as described.

6. In a sound reproducer, the combination of a hollow body having two chambers communicating through a port, a flexible  
55 member seated upon said port, anchored at one end, and slightly curved away from the

plane containing the mouth of said port at  
60 its other end, a floating weight, a pivoted stylus lever carried thereby and connections between the tail of said lever and the free end of said member substantially parallel to the latter, substantially as described. 65

7. In a sound reproducer, the combination of a body containing a chamber, a pipe connection thereto, a hollow member secured within said body and extending  
70 through said chamber and outside said body at one side, said member having a port connecting the interior thereof with said chamber and an opening from said interior outside said body, a flexible valve anchored at one end and seated upon said port, and  
75 means for communicating movement in accordance with sound vibrations to the free end of said valve lengthwise of the same to vary the extent of opening of said port, substantially as described. 80

8. In a sound reproducer, the combination of a hollow body having two chambers, a substantially vertical wall separating said chambers and having a port therein connecting said chambers, a flexible valve seated  
85 upon said port and secured at its upper end, a stylus lever pivoted below said body, and a link connecting said lever to the lower end of said valve and extending through the lower wall of said body in an approximately vertical direction, substantially as described. 90

9. In a sound reproducer, the combination with a hollow body adapted to have a column of fluid under pressure pass there-  
95 through, of a flexible member normally bent in the form of an arc of slight curvature suspended at one end across the path of said fluid within said body, and means for imparting reciprocating movement in accordance  
100 with sound vibrations to the free end of said member lengthwise of the same to set said fluid into corresponding amplified vibration, substantially as described.

10. In a sound reproducer, the combination  
105 with a flexible member normally bent in the form of an arc of slight curvature anchored at one end, of means for imparting reciprocating movement in accordance with sound vibrations to the free end of said  
110 member lengthwise of the same, substantially as described.

This specification signed and witnessed this 10th day of December 1909.

DANIEL HIGHAM.

Witnesses:

DYER SMITH,  
JOHN M. CANFIELD.







Patented July 30, 1912.

Fig. 2.

Fig. 3.

Fig. 4.

INVENTOR  
Eldridge R. Johnson.

WITNESSES  
J. H. Foster and  
J. H. Foster

WITNESSES  
F. J. Hartman.  
A. J. Gardner.

*Eldridge R. Johnson.*

**ATTORNEY**

# UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF MERION, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

## TALKING-MACHINE.

1,034,015.

Specification of Letters Patent.

Patented July 30, 1912.

Application filed January 25, 1910. Serial No. 539,927.

*To all whom it may concern:*

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of Merion, county of Montgomery, and State of Pennsylvania, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, clear, and exact disclosure, reference being had to the accompanying drawings, forming a part of this specification.

The main objects of this invention are to provide in a talking machine an improved support or mounting for a swinging sound box arm or tone arm; to provide improved means for limiting the movement of a tone arm; and to provide other improvements as will appear hereinafter.

In the accompanying drawings, Figure 1 is a fragmentary top plan view partially in horizontal section on line I—I of Fig. 2 of a talking machine constructed in accordance with this invention; Fig. 2 a fragmentary side elevation partly in vertical section on line II—II of Fig. 1, of the same; Fig. 3 a fragmentary side elevation partly in vertical section on line III—III of Fig. 1; and Fig. 4 a fragmentary vertical section of a portion of the same.

Referring to the drawings, one embodiment of this invention is shown applied to a talking machine comprising the usual casing having a horizontal supporting wall 1, carrying the usual turntable 2 for supporting a disk sound record 3. Arranged above the record support to cooperate with the record 3 is any suitable sound box or sound reproducer 4, which is pivoted in a well known manner by means of a U-tube 5, to the free smaller end of a tapering sound box arm or tone arm 6 with which it communicates. The free end of the tone arm 6 extends in a substantially horizontal direction and the larger end 7 of the tone arm is curved downwardly through an arc of about ninety degrees, terminating in a vertically disposed portion 8.

For supporting the tone arm 6 to swing about a fixed axis a bushing or tubular support 10 is provided, which extends tightly through an aperture provided therefor in the wall 1 of the casing. This bushing preferably projects above and below its supporting wall 1, and is provided with a

flange 11 integral therewith, which rests upon the upper surface of the wall to hold the bushing against downward movement.

The upper end of the bushing 10 is provided with an internal annular cylindrical recess 12, in the lower end of which tightly fits a circular spider 13, provided with a centrally arranged cylindrical aperture or bearing 14. This spider is held in place rigidly by a cylindrical ring 15, which fits snugly and is secured in any suitable manner in the recess above the spider. The lower end of the bushing 10 is also provided with an annular recess 16 in the upper end of which tightly fits a circular spider 17, having a central aperture 18, and this spider is held rigidly in place by a ring 19, which fits tightly and is secured in the recess below the spider.

The downturned end 7 of the tone arm 6 is cylindrical and fits snugly but is freely rotatable in the upper end of the bushing 10, in the recess above the ring 15. This downturned end 8 of the tone arm is also provided with an annular recess 25 in the upper end of which tightly fits a circular spider 26, having a central aperture 27, and this spider is held rigidly in place with respect to the tone arm by a ring 28, which is fitted in the recess below the spider.

For rotatably connecting the tone arm 6 to the bushing 10, a vertical pivot 30 extends rotatably through the central openings or bearings in the two spiders mounted in the bushing and also through the central opening or bearing in the spider mounted in the tone arm, and projects upwardly above the upper end of the bushing 10 through an aperture or bearing provided therefor in a lug 31, projecting outwardly from the upper surface of the tone arm 6 and integral therewith, these several bearings for the pivot being in vertical axial alinement.

To prevent movement of the pivot 30 downwardly, a collar 32 is removably fixed upon the pivot 30 by means of a pin 33 extending through the collar and the pivot, and this collar is arranged to bear upon the upper surface of the spider 13 in the upper end of the bushing. The lower end of the pivot 30 projects through the spider 17 in the lower end of the bushing and terminates below the spider. The portion of the pivot



projecting below the spider is reduced in diameter, to form a shoulder 34 spaced slightly below the bottom surface of the spider 17, and is threaded and provided with a nut 35, which is screwed tightly against the shoulder 34, to prevent the withdrawal of the pivot upwardly from its bearings, the pivot, however, having a slight amount of end play. The pivot is thus held in a fixed position axially by the two vertically spaced horizontal spiders 13 and 17 in the bushing 10, but is freely rotatable with respect to the bushing.

The upper end of the pivot 30 is preferably reduced in diameter, to form an upwardly facing shoulder 36, which is preferably arranged to engage against the inner surface of the tone arm and to support the weight of the tone arm. The tone arm 6 may be rigidly connected to the pivot 30 by means of a set screw 37, extending through the lug 31 of the tone arm and engaging against the pivot, or by any other suitable means.

For limiting the rotary movement of the tone arm 6, a stop is provided which consists of a yoke 40, which is rigidly secured within the bushing 10 and against the inner surface of the ring 15, in the upper end of the bushing by means of screws or bolts 41, which pass through the bushing from the outside thereof and are threaded into the yoke. This yoke is formed from a thin plate of metal or other suitable material, which is curved to conform to the inner cylindrical concave surface of the ring 15 and is provided with upwardly extending arms 42, which are arranged upon opposite sides respectively of a projection or bridge 43, of the spider 26, which is rigidly secured in the end of the tone arm 6.

The stop or yoke 40 is so proportioned and located that one arm of the yoke will engage against one side of the bridge 43 as the tone arm 6 is swung outwardly, to prevent the tone arm from swinging outwardly beyond what is necessary, and so that the other arm of the yoke will engage against the other side of the bridge as the tone arm is swung inwardly, to prevent any unnecessary inward movement of the tone arm. The arms 42 of the yoke are offset slightly inwardly so as to be normally out of contact with any part of the tone arm or parts carried thereby. The tone arm is thus freely revoluble upon its pivot 30 within the limits of the yoke or stop 40.

Although only a single form has been shown in which this invention may be embodied, it is obvious that many changes might be made in the construction illustrated without departing from the spirit of this invention or the scope of the appended claims.

Having thus fully described my inven-

tion what I claim and desire to protect by Letters Patent of the United States is:

1. In a talking machine, the combination with a tubular support, of fixed spaced bearings located within said support and coaxial therewith, a pivot mounted in said bearings, and a tone arm carried by said pivot and communicating with said support.

2. In a talking machine, the combination with a tubular support, of spaced spiders fixed in said support, a pivot in said support carried by said spiders, and a tone arm rotatable on said pivot and communicating with said support.

3. In a talking machine, the combination with a vertically arranged tubular support, of vertically spaced bearings fixed in said support coaxially therewith, a vertical pivot rotatably mounted in said bearings, and held against downward movement therein, and a rotatable tone arm mounted upon the upper end of said pivot and communicating with said support.

4. In a talking machine, the combination with a tubular support, of a tubular tone arm rotatable with respect to said support and forming a sound passage therewith, and means projecting in said passage for limiting the rotation of said tone arm.

5. In a talking machine, the combination with a tubular support, of a rotatable tubular tone arm communicating therewith, a projection within one of said tubular members and carried thereby, and a yoke within the other of said tubular members and carried thereby and embracing said projection to limit the rotation of said tone arm.

6. In a talking machine, the combination with a tubular support, of a pivot coaxial with said support, and carried thereby, a tubular tone arm rotatably connected to said tubular support by said pivot, a spider rigid with said tone arm and surrounding said pivot, a yoke within said support and having arms embracing a portion of said spider to limit the rotation of said tone arm, and means extending through said support and engaging said yoke to hold said yoke in position.

7. In a talking machine, the combination with a tubular support, of a tubular tone arm communicating therewith and provided with spaced bearings, and a pivot extending axially in said support and having a free end engaging in said bearings, for holding said tone arm rotatably in position.

8. In a talking machine, the combination with a tubular support having an upper open end, of a tubular tone arm having an outer portion extending transversely to said upper end of said support, and an inner portion longitudinally curved and terminating in an open end communicating with the upper end of said support, a pivot, and spaced means fixed with respect to said sup-

port for holding said pivot in fixed concentric longitudinal alinement, said pivot having a free end upon which said tone arm is mounted to swing in a fixed plane.

5 9. In a talking machine, the combination of a tubular support, of a tubular tone arm forming with said support a sound passage, a pivot in said passage, spaced bearings within said tubular support and fixed with  
10 respect to said tone arm and said pivot, and spaced bearings in said tone arm fixed with respect to said pivot, whereby said tone arm is restrained to swing in a fixed plane.

15 10. In a talking machine, the combination with a support having a sound conveying passage, of a tubular tone arm communicating therewith and provided with spaced bearings, and a pivot mounted in said pas-

sage and having a free end extending outside of said support and engaging in said 20 bearings for holding said tone arm rotatably in position.

11. In a talking machine, the combination with a support, of a pivot, spaced means carried by said support for holding said 25 pivot in fixed alinement longitudinally, said pivot having an upper free end, and a tone arm mounted upon said free end to swing in a fixed plane.

In witness whereof I have hereunto set 30 my hand this 22nd day of January A. D. 1910.

ELDRIDGE R. JOHNSON.

Witnesses:

RALPH L. FREEMAN,  
CHARLES K. HADDON.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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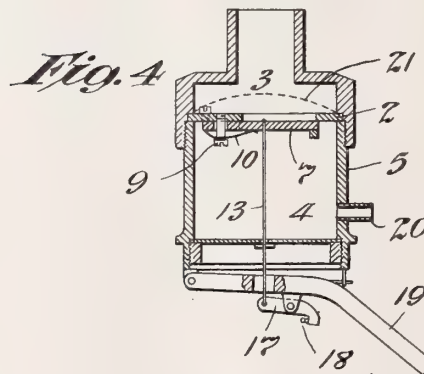
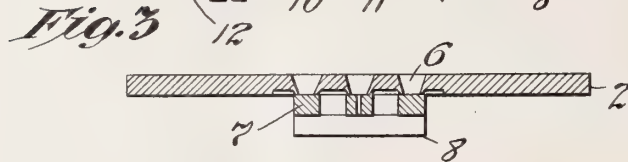
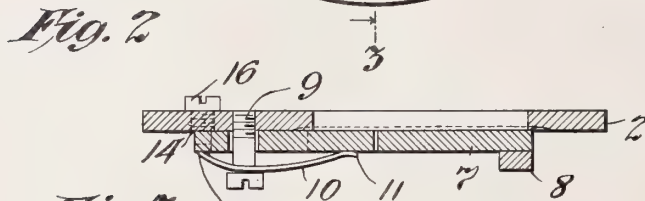
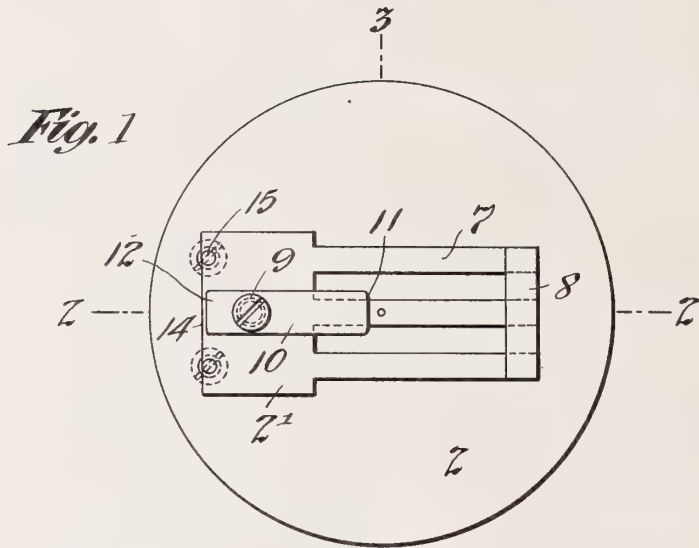




A. N. PIERMAN.  
SOUND REPRODUCER.  
APPLICATION FILED APR. 13, 1907.

1,034,031.

Patented July 30, 1912.



*Witnesses:*  
Frank D. Lewis  
H. H. Dyke

*Inventor:*  
Alexander A. Pierman  
by Frank L. Dyer  
*Atty.*

# UNITED STATES PATENT OFFICE.

ALEXANDER N. PIERMAN, OF NEWARK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## SOUND-REPRODUCER.

1,034,031.

Specification of Letters Patent. Patented July 30, 1912.

Application filed April 13, 1907. Serial No. 367,917.

*To all whom it may concern:*

Be it known that I, ALEXANDER N. PIERMAN, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Sound-Reproducers, of which the following is a description.

My invention relates to sound reproducers of the fluid pressure operated type, and has for its object the provision of means whereby improved results in the reproduction of sounds will be secured.

My invention consists of an improved form of valve for varying the rate of flow of elastic fluid through the ports by which the resonating and equalizing chambers of the reproducer communicate, and in improved means for supporting the valve referred to, and in the parts, improvements and combinations which are hereinafter pointed out and claimed.

In order that my invention may be better understood attention is called to the accompanying drawings forming a part of this specification, wherein—

Figure 1 is a bottom plan view of the port plate; Fig. 2 is a cross section on the line 2—2 of Fig. 1; Fig. 3 is a cross section on line 3—3 of Fig. 1 and Fig. 4 is a vertical cross section of a reproducer embodying my invention.

Throughout this specification and in all the figures of the drawings, the same numerals of reference are used to designate corresponding parts.

The port plate or partition 2 is interposed between the resonating chamber 3 and the equalizing chamber 4 of the reproducer 5, which is designed to be borne upon the carrying arm of the phonograph. In this plate are formed ports 6 whose walls preferably converge toward the lower face of the said plate. The improved valve has the form of a preferably rigid plate the greater part of whose length is slotted to form parallel tongues 7 the number of which corresponds with the number of ports in the port plate 2 with which the valve plate coöperates. The ends of the tongues 7 are connected by a bridge 8 which is secured thereon preferably by shellac or cement. This bridge keeps the valve plate flat and prevents separate vibrations in the individual

valve tongues. The valve plate and bridge are preferably made of a light metal, as aluminum. I have obtained very favorable results by the use of valves having three tongues of the relative proportions illustrated. In my former pending applications above identified the valve plate is shown rigidly attached to the port plate and operated to open and close the ports by flexing. In the valve disclosed herein I have done away with the rigid fastening of the valve to the port plate and with the flexure of the valve and the resistance which is due thereto. The present valve has all the advantages of a hinged valve or a flexible valve without the disadvantage of the friction which is necessarily present in a hinged or a flexible valve. To this end I provide positioning means so that the valve will always remain in position on the face of the port plate, and I also provide resilient supporting means to press the valve against the port plate, and these resilient supporting means are so positioned and proportioned that the valve is pressed against the port plate more forcibly toward the end thereof opposite the tongue 7 than elsewhere. The valve being supported in this manner when it is opened by the pressure of elastic fluid thereon and by the pull of the stylus, will turn upon its end opposite the tongues 7 as a fulcruming line.

The particular means which is illustrated in the drawings for resiliently supporting the valve plate is the following: A headed screw 9 is passed through an opening in a leaf spring 10 and is then passed loosely through an opening in the valve plate 2', and secured in a threaded opening in the port plate 2. As shown, the opening in the spring 10 is formed at one side of the middle thereof and the opening in the valve plate through which the screw passes is close to that end of the valve opposite the tongues 7. When the parts are thus assembled the ends of the spring bear against the valve plate and press it against the port plate. The end 11 of the spring which is longer than the end 12, may, if desired, be made to press against one of the tongues 7 of the valve plate as shown. An opening is made in one of the tongues 7 for the reception of the link 13 which connects the valve with the stylus lever. As will be evident from Figs. 1 and 2



- of the drawings, the upward pressure of the spring 10 while applied to the entire surface of the valve which contacts with the port plate, is greatest toward the left hand end of the valve plate, and when downward pressure is applied to the valve by the link connected to the stylus lever and by air pressure thereon, the valve will be depressed and will turn on the line 14 at its left hand edge as a fulcruming line, and the only friction or flexure will be in the spring 10 which is initially adjusted by means of the screw 9 to counterbalance the pressure due to gravitation and atmospheric pressure.
- Any form of positioning means to keep the valve plate and the port plate in the same relative position may be used. I preferably provide one of the said plates with projections and the other with apertures in which the said projections are received. These positioning means I place as near as possible to the fulcruming line 14 where the motion of the valve plate is least. The positioning means which I have shown in the drawings comprises studs 15 formed on screws 16 which screws pass through the port plate 2, the studs 15 projecting therebelow and fitting into openings in the valve plate 2'. These openings are made slightly larger in diameter—about .001"—than the studs 15, and with the studs serve to position the valve plate upon the port plate, but do not attach it thereto. In order to avoid cushioning of the valve plate upon the port plate, I cut away the material around the slots 6 leaving only knife edges for the valve to rest upon.
- As shown in Fig. 4, the link 13 passes through the bottom of the equalizing chamber 4, and is connected to the stylus lever 17 carrying the stylus 18. The stylus lever is pivoted upon the floating weight 19. A nipple 20 is attached at the side of the equalizing chamber and a tube leading to a suction apparatus may be connected thereto. A dirt screen 21 is provided to prevent dust and dirt from getting into the valve.
- Of course pressure instead of suction may be utilized for operating the valve, and if pressure greater than atmospheric pressure were used, the port plate 2 and the valve plate 2' assembled as shown will be reversed so as to be properly actuated by pressure within the chamber 4, as will be understood.
- I claim—
1. In a sound reproducer a port plate, a valve plate in contact with the said port plate, resilient means for pressing the said valve plate against the port plate, said means constituting the sole means of attachment between said plates, and a stylus connected to said valve plate, substantially as set forth.
  2. In a sound reproducer a port plate, a valve plate in contact with the said port plate, resilient means for pressing the said valve plate against the port plate more forcibly at one end of the said valve plate than elsewhere, said resilient means constituting the sole means of attachment between said plates, and a stylus connected to said valve plate, substantially as set forth.
  3. In a sound reproducer, a port plate, a valve plate bodily movable away from the said port plate, means for positioning the one plate with respect to the other, resilient means for holding the plates in contact, said means constituting the sole means of attachment between said plates and a stylus connected to said valve plate, substantially as set forth.
  4. In a sound reproducer, a port plate, a valve plate, and means for resiliently supporting the valve plate in contact with the port plate so that it may turn bodily upon one of its edges, substantially as set forth.
  5. A sound reproducer comprising a resonating chamber and an equalizing chamber communicating through ports, a bodily movable valve normally closing said ports, and resilient means for supporting the valve in contact with its seat so that it may turn bodily upon one of its edges, substantially as described.
  6. In a sound reproducer, a port plate, a valve plate contacting the same, means for positioning the one plate with respect to the other, an adjusting screw carried by the port plate and passing loosely through an opening in the valve plate, and a leaf spring interposed between the head of said screw and the valve plate, said screw and spring constituting the sole means of attachment between said plates.
  7. In a sound reproducer, the combination of a body formed with resonating and equalizing chambers, a port plate interposed between said chambers, a valve plate in contact with said port plate, resilient means for pressing said valve plate against said port plate, said means constituting the sole means of attachment between said plates, and means for operating said valve, substantially as set forth.
  8. In a sound reproducer, the combination of a body formed with resonating and equalizing chambers, a plate having ports therein interposed between said chambers, a valve plate provided with tongues covering said ports and contacting said first named plate, means for positioning the one plate with respect to the other, and resilient means for holding the valve plate in contact with the port plate, said last named means constituting the sole means of attachment between said plates, substantially as set forth.
  9. In a sound reproducer, a plate having ports therein, a valve plate provided with tongues covering said ports and contacting said first plate, means for positioning the

one plate with respect to the other, and resilient means for holding the valve plate in contact with the port plate with greater force at one end of said valve plate than  
5 elsewhere, said last named means constituting the sole means of attachment between said plates, substantially as set forth.

This specification signed and witnessed this 11th day of April 1907.

ALEXANDER N. PIERMAN.

Witnesses:

FRANK L. DYER,

FRANK D. LEWIS.

---

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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J. JETTER.  
NEEDLE HOLDER FOR TALKING MACHINES.  
APPLICATION FILED MAY 5, 1911.

1,034,387.

Patented July 30, 1912.

Fig. 1.

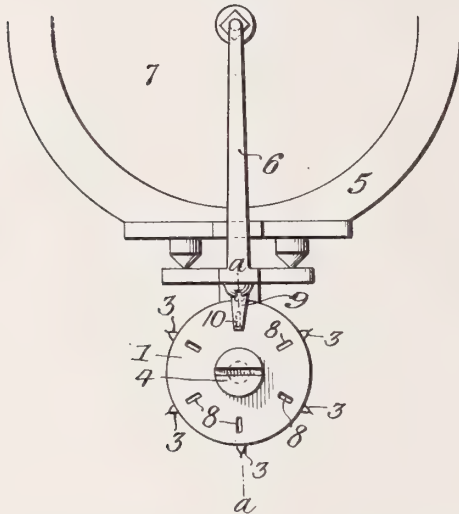


Fig. 2.

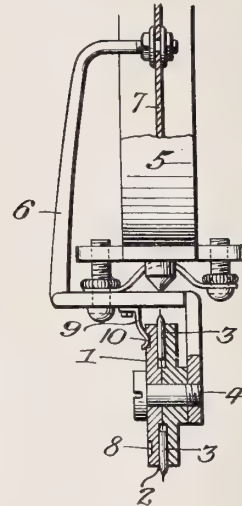


Fig. 8.

Fig. 3.



Fig. 4.

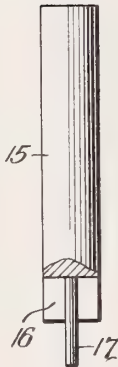


Fig. 5.



Fig. 6.

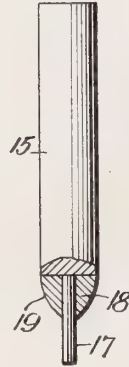


Fig. 7.

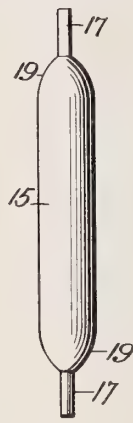
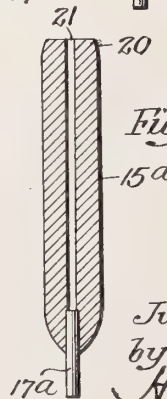


Fig. 9.



Fig. 10.



Witnesses-

Wm. Cullinger  
Wm. A. Burrows

Inventor-  
Julius Jetter  
by his Attorneys  
Hudson & Hudson

# UNITED STATES PATENT OFFICE.

JULIUS JETTER, OF CAMDEN, NEW JERSEY.

NEEDLE-HOLDER FOR TALKING-MACHINES.

1,034,387.

Specification of Letters Patent.

Patented July 30, 1912.

Original application filed December 16, 1908. Serial No. 467,821. Divided and this application filed May 5, 1911. Serial No. 625,227.

*To all whom it may concern:*

Be it known that I, JULIUS JETTER, a citizen of the United States, and a resident of Camden, Camden county, New Jersey, have invented certain Improvements in Needle-Holders for Talking-Machines, (being a division of my application for patent for a needle for sound recording and reproducing machines, filed December 16, 1908, Serial No. 467,821,) of which the following is a specification.

My invention relates to machines of the character known as "talking machines", more particularly those employing disk records; and the object of my invention is to provide a multiple needle holder which may be mounted upon a suitable supporting arm whereby attachment may be made to the recording or reproducing element of the talking machine.

The needles ordinarily employed when reproducing talking machine records wear out very rapidly, and it is the present practice to supply a fresh needle for every record. Attempts have been made to produce a needle capable of use for a number of records, but they have not proved very satisfactory, and in general the high cost of production has usually prevented their adoption.

The multiple structure forming the subject of my invention is rotatable and operates in such a way as to permit the needles carried thereby to be used consecutively and afterward removed at one time and others set in their places, and it may be made of any suitable material, preferably metal.

These and other features of my invention are more fully referred to hereinafter, reference being had to the accompanying drawings, in which:

Figure 1 is an elevation of a multiple needle holder embodying my invention; Fig. 2, is a side elevation of the same, partly in section, on the line *a-a*, and Figs. 3, 4, 5, 6, 7, 8, 9 and 10, are views illustrating forms of needles which may be mounted for use in the structure embodying my invention shown in Figs. 1 and 2.

My invention comprises certain improvements in needles, and in carriers therefor adapted to receive a plurality of needles, which needles may be of the usual type now employed in the reproduction of talking

machine records, or they may be of the special type forming part of my invention.

In Figs. 1 and 2, of the drawings, 1 represents a circular duplex member internally grooved so as to present a series of openings 2 in its periphery or rim into which needles 3 may be placed and retained by any suitable means, such as a screw 4, which also serves to secure the holder to the sound-box. This holder is held to the sound-box 5 at the usual point in line with the arm 6 connected to the diaphragm 7, with the points of the needles preferably in the same plane as the diaphragm. To maintain the holder in the position of use with any desired needle in position for engagement with a record, the face of the holder may be recessed at the points 8 in line with the needles carried thereby, and a spring finger 9 supported by the sound-box 5 may be provided, having an end 10 arranged to rest in said recesses. By these or any other suitable means any needle point when brought to the position of use by turning the holder may be firmly held in such position for proper engagement and coaction with a record.

Any ordinary needle used for reproduction in connection with disk records may be employed with or carried by my improved holder. I may also employ a special needle forming part of my invention.

In Figs. 3 to 8, both inclusive, 15 represents a section of wire, preferably of iron or soft steel. This wire may be notched or slotted at 16 by any suitable means, and in this slot I place a short section 17 of hard wire, preferably piano wire, of a suitable gage; care being taken that the slot formed shall just be large enough to receive the wire. The hard wire is preferably centered in the slotted end of its carrier, and is preferably held with solder, as indicated at 18. After this has been done, the end of the wire carrier may be beveled at 19 in the form of the usual needles, and the opposite end of the carrier will also be slightly beveled, as indicated at 20, so as to readily fit into the holder of a sound-box, or the multiple holder shown in Figs. 1 and 2. When the compound needle is finished in the desired manner, the whole may be nicked or silvered so as to provide a coating that will cover the soldered joint and



the slot or notch into which the hardened point has been fitted. In Fig. 8, I have shown a double pointed needle made in precisely the same way as the single pointed  
5 needle.

In lieu of slotting or notching the ends of a short section of wire to form a carrier, I may take a tubular or hollow wire section 15<sup>a</sup>, for instance, and form a carrier therefrom as shown in Figs. 9 and 10; insert a section 17<sup>a</sup> of hardened wire in the opening 21 of said tube, and then secure said wire in place. This may be done by compressing the tube around the wire, as indicated. Finished needles or styli thus made present the appearance of ordinary one-piece needles, and are capable of considerable use; individual samples produced by me having been used with more than two hundred records.  
20

By having a multiple holder such as proposed containing a half-dozen or more needles, means are provided for taking care of a very large number of records without renewal.  
25

I claim:

1. A needle element for sound recording and reproducing machines comprising a plurality of disks revolubly mounted upon a central axis, removable needles adapted to be confined radially between said disks, and means for securing said disks together.  
30

2. A needle element for sound recording and reproducing machines comprising a plurality of disks revolubly mounted upon a central axis, removable needles adapted to be confined radially between said disks, and means for preventing movement of said element when a needle carried thereby is in engagement with a record.  
40

3. A needle element for sound recording and reproducing machines comprising a plurality of disks revolubly mounted upon a central axis, the meeting face of one of said disks being grooved, removable needles adapted to be confined radially between said disks and fitting said grooves, and means for securing said disks together.  
45

4. A needle element for sound recording and reproducing machines comprising a plurality of disks mounted upon a central axis, the meeting faces of said disks being grooved, removable needles adapted to be confined between said disks and fitting the grooves of the same, and means for securing said disks together.  
55

5. A device of the class recited, comprising a fixed support, a rotatable disk-like

member equipped with a plurality of radially disposed detachable needles, means for clamping said needles with respect to the said member, and means for preventing movement of said member when a needle carried thereby is in engagement with a record.  
60

6. A device of the class recited, comprising a fixed support, a disk-like member provided with a plurality of radially extending grooves mounted with respect to said support, needles for said grooves, means for clamping said needles within said grooves, and means for preventing movement of said member when a needle carried thereby is in engagement with a record.  
65

7. A device of the class recited, comprising a fixed support, a disk-like member provided with a plurality of radially disposed grooves rotatably mounted with respect to said support, a needle within each groove, a removable plate for preventing the escape of the needles, means for clamping the plate in place, and means for preventing movement of said member when a needle carried thereby is in engagement with a record.  
70

8. A device of the class recited comprising a fixed support, a rotatable disk-like member equipped with a plurality of radially disposed detachable needles, means for clamping said needles with respect to the said member and means for preventing retrograde movement of said member.  
75

9. A device of the class recited comprising a fixed support, a disk-like member provided with a plurality of radially extending grooves rotatably mounted with respect to said support, needles for said grooves, means for clamping said needles within said grooves, and means for preventing retrograde movement of said member.  
80

10. A device of the class recited comprising a fixed support, a disk-like member provided with a plurality of radially disposed grooves rotatably mounted with respect to said support a needle within each groove, a removable plate for preventing the escape of the needles, means for clamping the plate to place and means for preventing retrograde movement of said member.  
85

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.  
90

JULIUS JETTER.

Witnesses:

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WM. A. BARR.



A. E. SPENCER & F. C. THOMAS.  
 MEANS FOR AUTOMATICALLY ARRESTING TALKING MACHINES.  
 APPLICATION FILED MAR. 22, 1912.

Reissued July 30, 1912.

13,453.

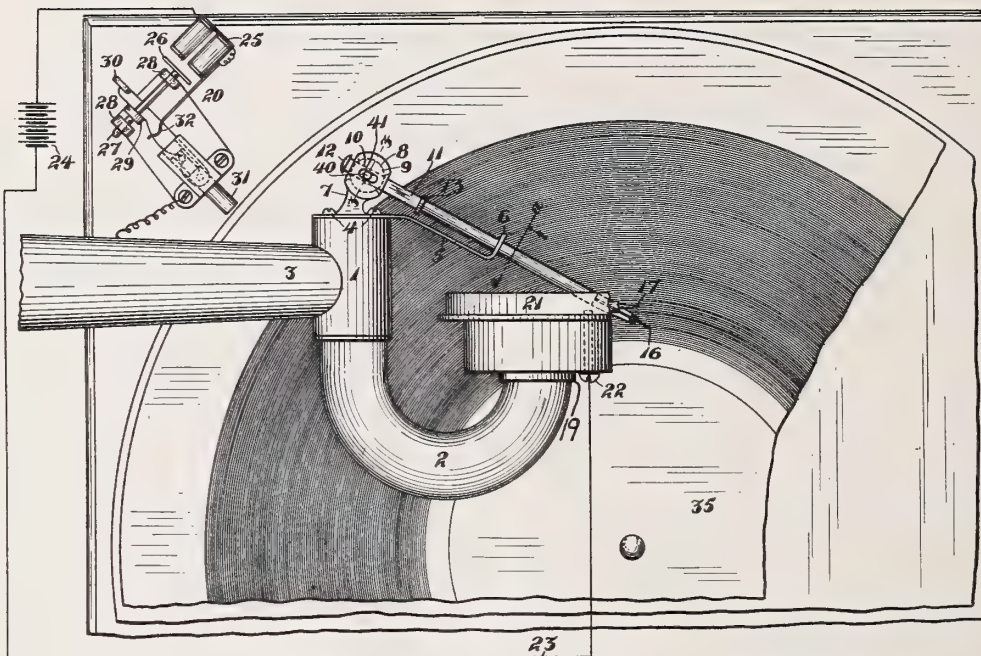


Fig. 1.

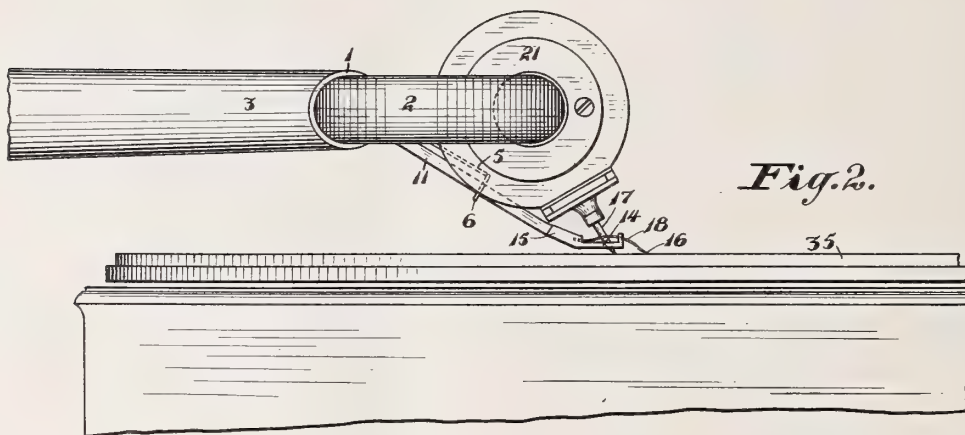


Fig. 2.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 3.

WITNESSES



INVENTORS  
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 F. C. Thomas  
 J. M. Wright  
 Attorney

F. C. Thiedner  
 N. B. Keating



# UNITED STATES PATENT OFFICE.

ARTHUR E. SPENCER, OF SAN FRANCISCO, AND FRANK C. THOMAS, OF MILL VALLEY,  
CALIFORNIA.

## MEANS FOR AUTOMATICALLY ARRESTING TALKING-MACHINES.

13,453.

Specification of Reissued Letters Patent. **Reissued July 30, 1912.**

Original No. 998,807, dated July 25, 1911, Serial No. 593,636. Original Reissue No. 13,305, dated October 31, 1911, Serial No. 644,711. Application for this reissue filed March 22, 1912. Serial No. 685,620.

### *To all whom it may concern:*

Be it known that we, ARTHUR E. SPENCER and FRANK C. THOMAS, citizens of the United States, residing, respectively, at San Francisco, in the county of San Francisco, and Mill Valley, in the county of Marin and State of California, have invented new and useful Improvements in Means for Automatically Arresting Talking-Machines, of which the following is a specification.

This invention relates to means for arresting the rotation of a talking machine automatically upon the stoppage of the sounds produced by the talking machine.

One object of the invention is to provide a device for accomplishing this and which will not necessitate any change in the form or construction of the record itself or in the mode of using the talking machine.

A further object is to provide such a device of a very simple construction.

In the accompanying drawing, Figure 1 is a broken plan view of a talking machine equipped with our invention; Fig. 2 is a broken side view thereof; Fig. 3 is a detail cross section on the line 3—3 of Fig. 1; Fig. 4 is a detail vertical section on the line *a—a* of Fig. 1; showing the positions of the parts when the tone tube is elevated; Fig. 5 is a similar view showing the positions of the parts when the tone tube is lowered to its operative position; Fig. 6 is a similar view showing the positions of the parts when the tone tube is also in the lower position but the pin has arrived at the end of the record.

Referring to the drawing, upon the thimble 1 which secures the tone tube 2 to the sound tube 3 is rigidly secured, as by screws 4, an arm 5, from the end of which depends a loop 6. Also secured to said thimble is a small bracket 7, formed with a socket 8, in which can turn a ball 9, having a bearing 10 in which can slide a rod 11 the end of said rod having a head 12 and said rod having a collar 13. Said head and collar prevent the rod sliding out of its bearing 10. The rod is flattened where it passes

through the bearing, so that it cannot turn therein, and the ball has a pin 40 in a slot 41 in the bracket to prevent the turning of the ball about an axis parallel with the rod. Said rod extends through the loop 6 suspended from the end of the arm 5, and its front or lower end 15 is formed with a bearing 14 in which is secured a small piece of catgut 18 the lower end 16 of which preferably tapers to a fine point. Said bearing 14 is so formed that the catgut can easily be removed and a new piece inserted therein when necessary.

The loop 6 tapers toward the lower end, so that, when the tone tube is raised, the rod 11 passing through said loop 6, rests in said lower end thereof and when the stylus 17 of the talking machine is lowered on to the record 35, the end 16 of the catgut assumes a position slightly nearer the center of the record than the end of the stylus 17. When the catgut descends into contact with the record, it, and the rod 11, are supported by the record, but the loop 6 can drop a short distance lower so that the rod 11 no longer contacts with said loop, but assumes a position centrally thereof, as shown in Fig. 5. When the rod 11 no longer rests in the bottom of the loop the catgut would, but for the groove in the record, be shifted by the rotation of the record, until the rod 11 assumed a tangential position with reference to the circle described on the record by the lower end of the catgut, and before it arrived at this position, the bearing 14 would contact with the stylus 17. But on account of the record being grooved, this result does not take place, for the catgut is, by the weight of the rod 11, held in the sound-producing spiral groove in the record into which it dropped, and, as before stated, is slightly nearer the center than the stylus 17, and, in the rotation of the record, it is compelled to follow said groove always slightly within, or in advance of, the stylus. However, when the catgut arrives at the inner end of the spiral groove it no longer moves in advance of the stylus, the cause of



its so moving inward no longer existing. The stylus 17 continues to follow the spiral groove of the record, and, in the rotation of the record, approaches more and more  
 5 closely to the bearing 14 which holds the catgut, and eventually contacts with the same, and thus connects a circuit 20, which, on the side of the bearing 14, extends through the sound tube and the frame of  
 10 the machine, and on the side of the stylus extends from the reproducer 21 to a screw 22 which is on the reproducer and thence by a wire 23 to a galvanic cell 24 preferably contained in the box of the talking machine.  
 15 Since as commonly constructed the reproducer 21 is supported upon the tone tube 2 by an interposed sleeve 19 of rubber, the electric circuit is not closed by said tone tube. In this circuit is an electro-magnet 25  
 20 which attracts an armature 26 on a stem sliding in bearings 28 and which carries a collar 29 adapted to actuate the lever 30 used at present to operate the brake 31 of the talking machine. When said lever is  
 25 actuated, it breaks a contact in the circuit 20, consisting of said lever 30, and a bent wire 32 secured to the electro-magnet. When the brake 31 is removed, said contact is again closed by the lever, and the circuit  
 30 20 is open at the stylus and catgut holder, and is adapted to be closed in the same manner as before.

When the tone tube is raised for use with another record the arm 11 drops into the  
 35 tapering lower end of the loop 6, and the holder is therefore out of electrical connection with the stylus, also said arm slides back in its bearing until the collar abuts against the bracket so that the catgut is out  
 40 of the way when removing the stylus and replacing it by another.

We do not confine our invention to the arrangement here shown in which the stylus itself closes the electric circuit, controlling the brake, as this electric circuit may be  
 45 closed by contact of any parts moving respectively with the catgut on the one hand and the stylus on the other. Nor do we limit our invention to the means here shown  
 50 for producing said relative motion, said means being the oblique arrangement of the rod 11 to the arm carrying the stylus, as any positive means could be employed to produce this relative movement when permitted  
 55 to do so by the arrival of the catgut at the end of the spiral groove.

We claim:—

1. In combination with a rotating record having a record groove, a talking machine  
 60 having reproducing mechanism, adapted to engage said groove, a device engaging the groove at a different point from the reproducing mechanism, an electric circuit, means movable respectively with said device and

said reproducing mechanism and connected 65 to opposite sides of said circuit to close the circuit by contact with each other due to a movement relative to one another of said reproducing mechanism and device, an electro-magnet in said circuit, and a brake for 70 the record controlled by said electro-magnet.

2. In combination with a rotating record having a record groove, a talking machine having reproducing mechanism, adapted to engage said groove, a holder carried by said 75 talking machine, a filament carried by said holder and engaging the groove at a different point from the reproducing mechanism, an electric circuit, means movable with said reproducing mechanism, said means and 80 said holder being connected to opposite sides of said circuit to close the circuit by contact with each other due to a movement relative to one another of said reproducing mechanism and holder, an electro-magnet in said 85 circuit, and a brake for the record controlled by said electro-magnet.

3. In combination with a rotatable record having a record groove and means for rotating said record, reproducing mechanism 90 having a part engaging said groove, means also having a part engaging said groove and movably carried by said reproducing mechanism so that the latter part engages the groove at a substantially uniform distance 95 from the first-named part, a brake, and brake-setting mechanism, normally inoperative when said parts are at a uniform distance from one another, and arranged to be actuated by the approach of one of said 100 groove-engaging parts to the other.

4. In combination with a rotatable record having a record groove, and means for rotating said record, reproducing mechanism having a part engaging said groove, means 105 also having a part engaging said groove, and suitably supported to permit said latter part to be moved, relatively to the record, by its engagement with the groove and the rotation of said record, a brake, and brake- 110 setting mechanism arranged to be actuated by the approach of one of said groove-engaging parts to the other.

5. In combination with a rotatable record having a record groove, and means for rotating said record, reproducing mechanism having a part engaging said groove, means 115 also having a flexible part engaging said groove, and suitably supported to permit said flexible part to be moved, relatively to the record, by its engagement with the groove and the rotation of said record, a brake, and brake-setting mechanism arranged to be actuated by the approach of one of said groove-engaging parts to the other. 125

6. In combination with a rotatable record having a record groove, and means for rotating said record, reproducing mechanism

having a part engaging said groove, means  
also having a part adapted to engage the  
groove of the record without injury thereto  
by the rotation of the record and adapted to  
5 be moved transversely to the record by said  
engagement and rotation, a brake, and  
brake-setting mechanism arranged to be ac-

tuated by the approach of one of said  
groove-engaging parts to the other.

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FRANK C. THOMAS.

Witnesses:

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N. B. KEATING.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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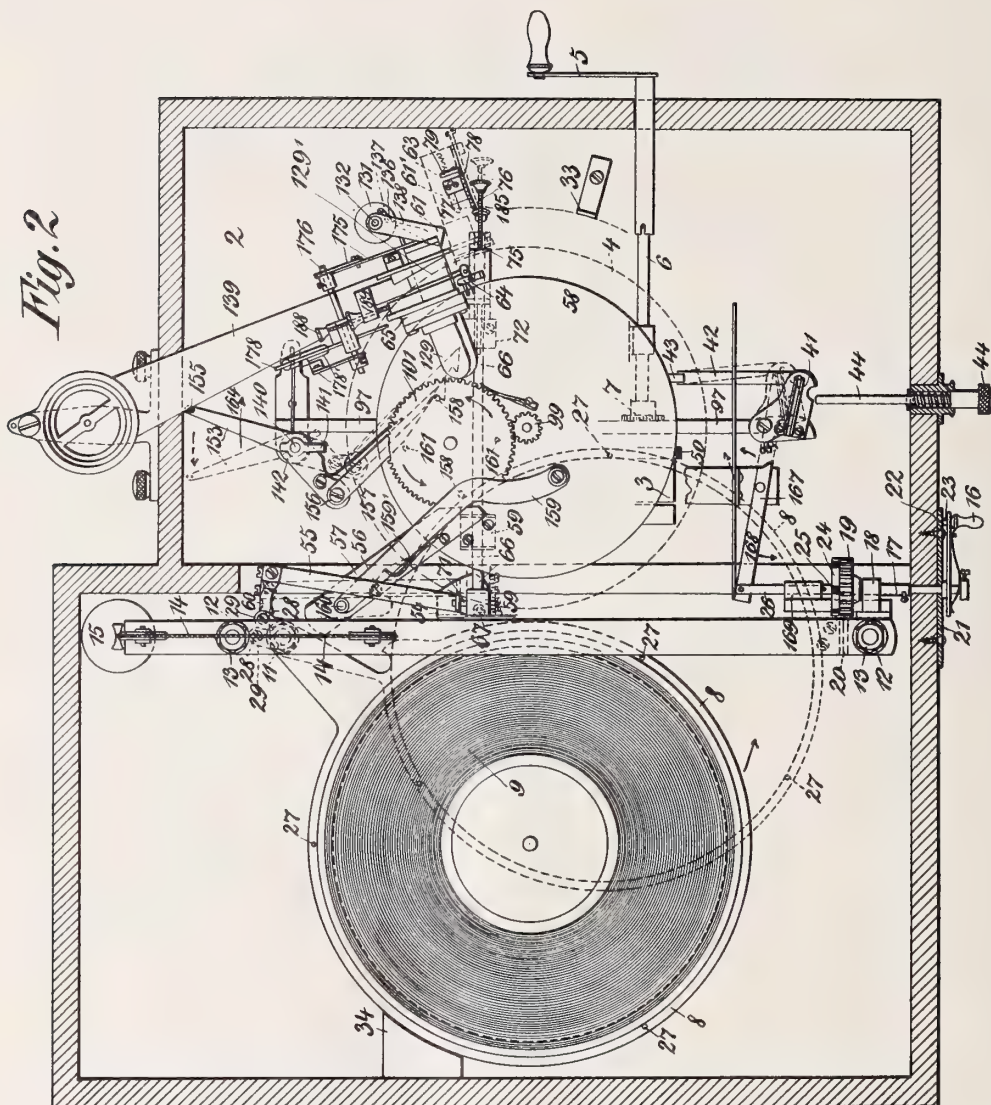












Witnesses  
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C. VOGT.  
TALKING MACHINE.

APPLICATION FILED FEB. 6, 1906.

Patented Aug. 6, 1912.

16 SHEETS—SHEET 3.

1,034,664.

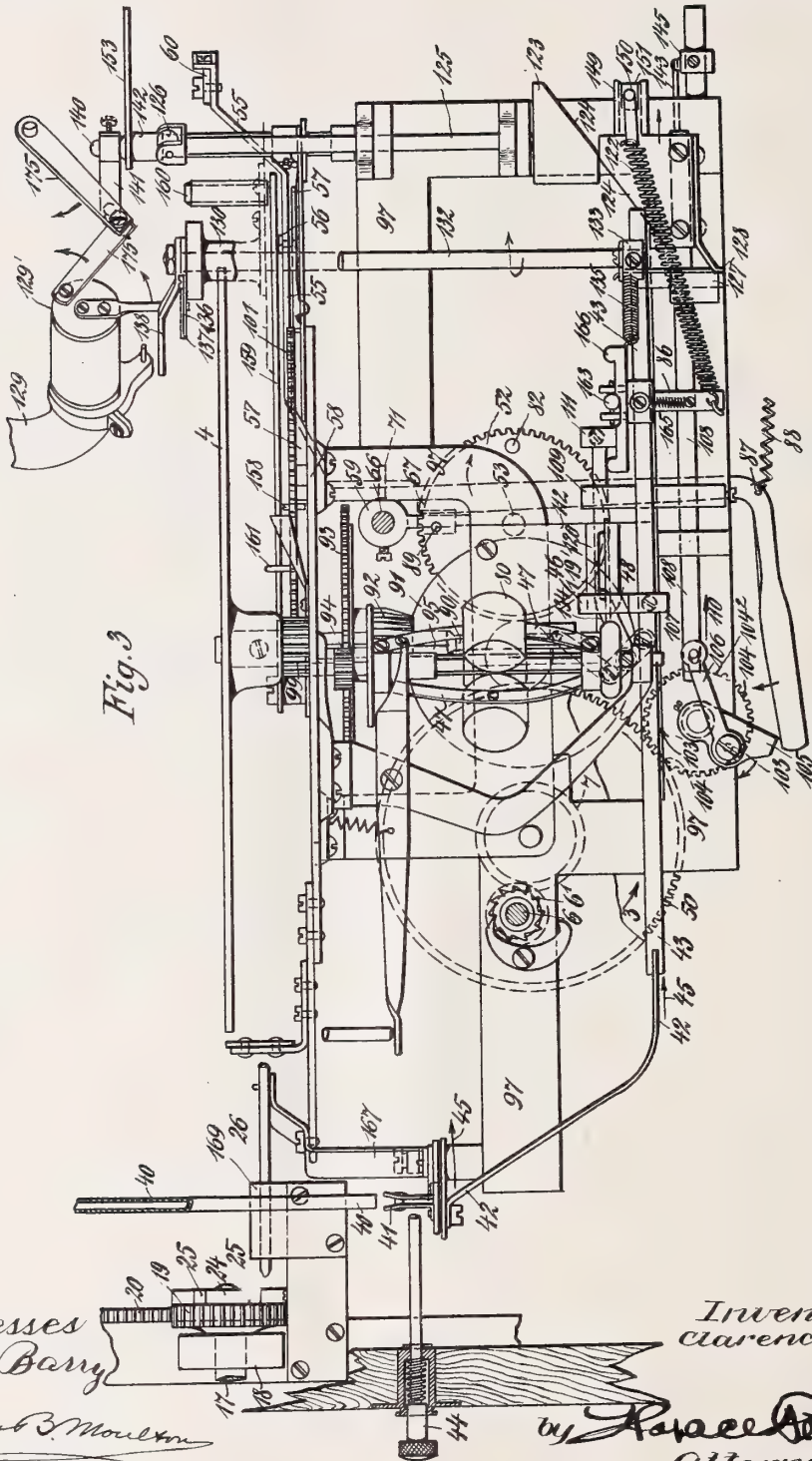


Fig. 3

Witnesses  
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C. VOGT.

TALKING MACHINE.

APPLICATION FILED FEB. 6, 1906.

1,034,664.

Patented Aug. 6, 1912.

16 SHEETS—SHEET 4.

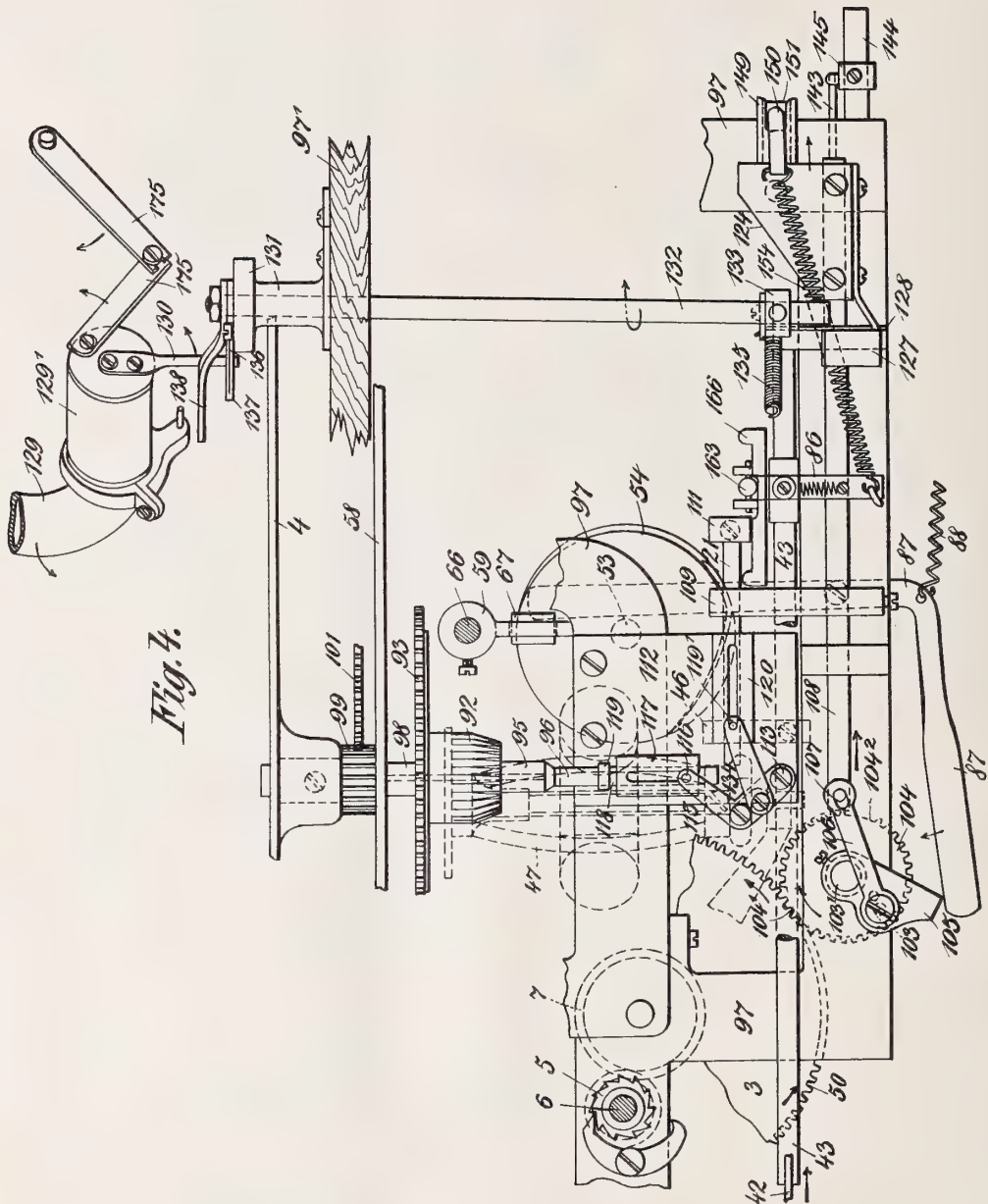


Fig. 4.

Witnesses  
F. C. Barry  
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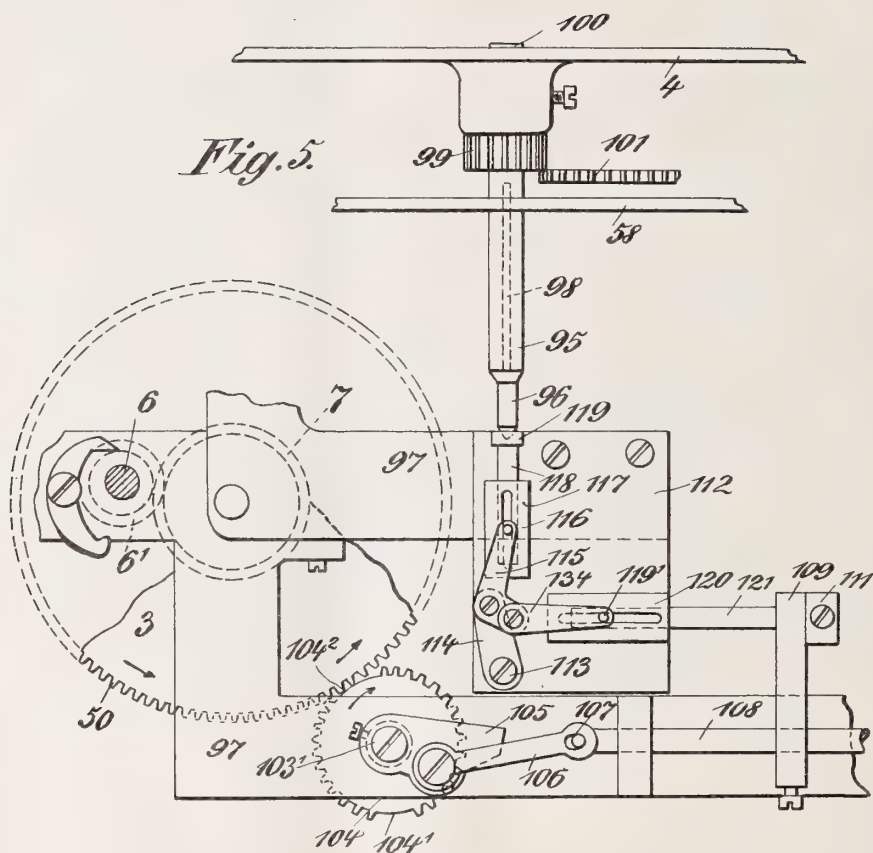




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TALKING MACHINE.  
APPLICATION FILED FEB. 6, 1906.

Patented Aug. 6, 1912.  
16 SHEETS—SHEET 5.



Witnesses  
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C. VOGT.  
TALKING MACHINE.

APPLICATION FILED FEB. 6, 1906.

1,034,664.

Patented Aug. 6, 1912.

16 SHEETS—SHEET 6.

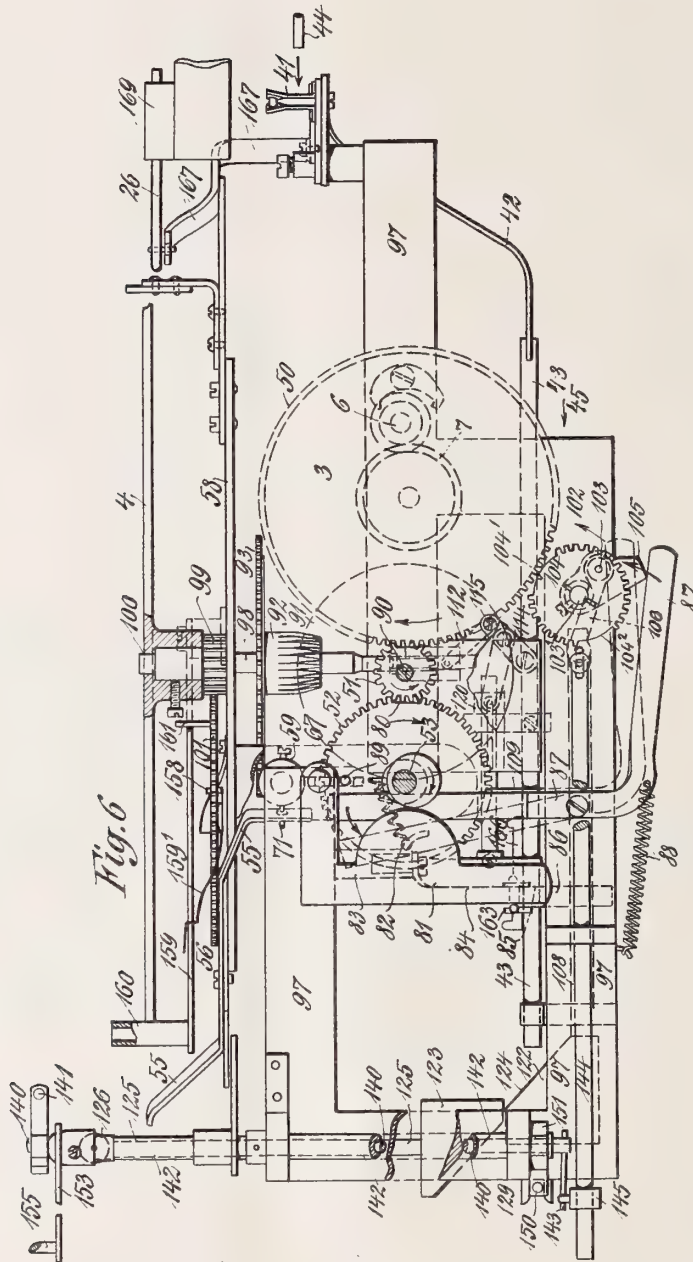


Fig. 6

Witnesses  
J. E. Barry  
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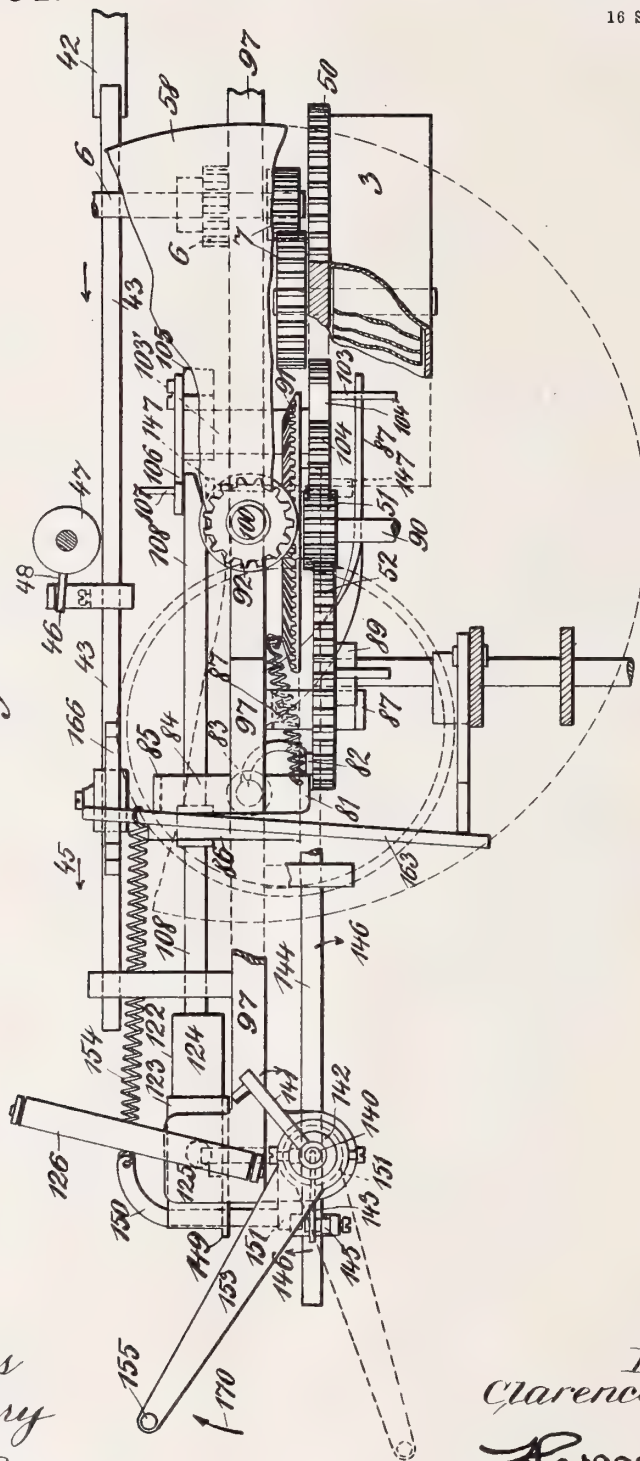
1,034,664.

C. VOGT.  
TALKING MACHINE.  
APPLICATION FILED FEB. 6, 1906.

Patented Aug. 6, 1912.

16 SHEETS—SHEET 7.

Fig. 7.



Witnesses  
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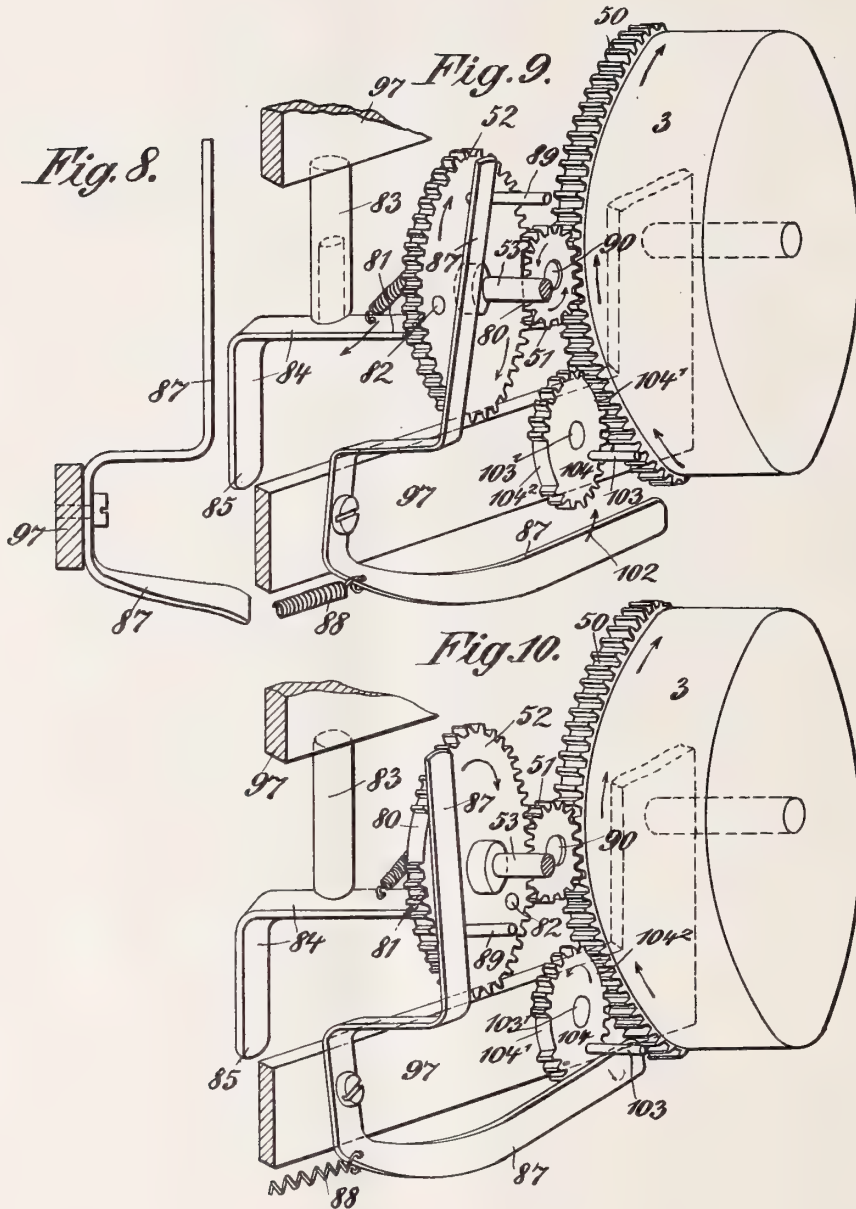
C. VOGT.  
TALKING MACHINE.

APPLICATION FILED FEB. 6, 1906.

1,034,664.

Patented Aug. 6, 1912.

16 SHEETS—SHEET 8.



Witnesses  
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C. VOGT.  
TALKING MACHINE.  
APPLICATION FILED FEB. 6, 1906.

1,034,664.

Patented Aug. 6, 1912.  
16 SHEETS—SHEET 9.

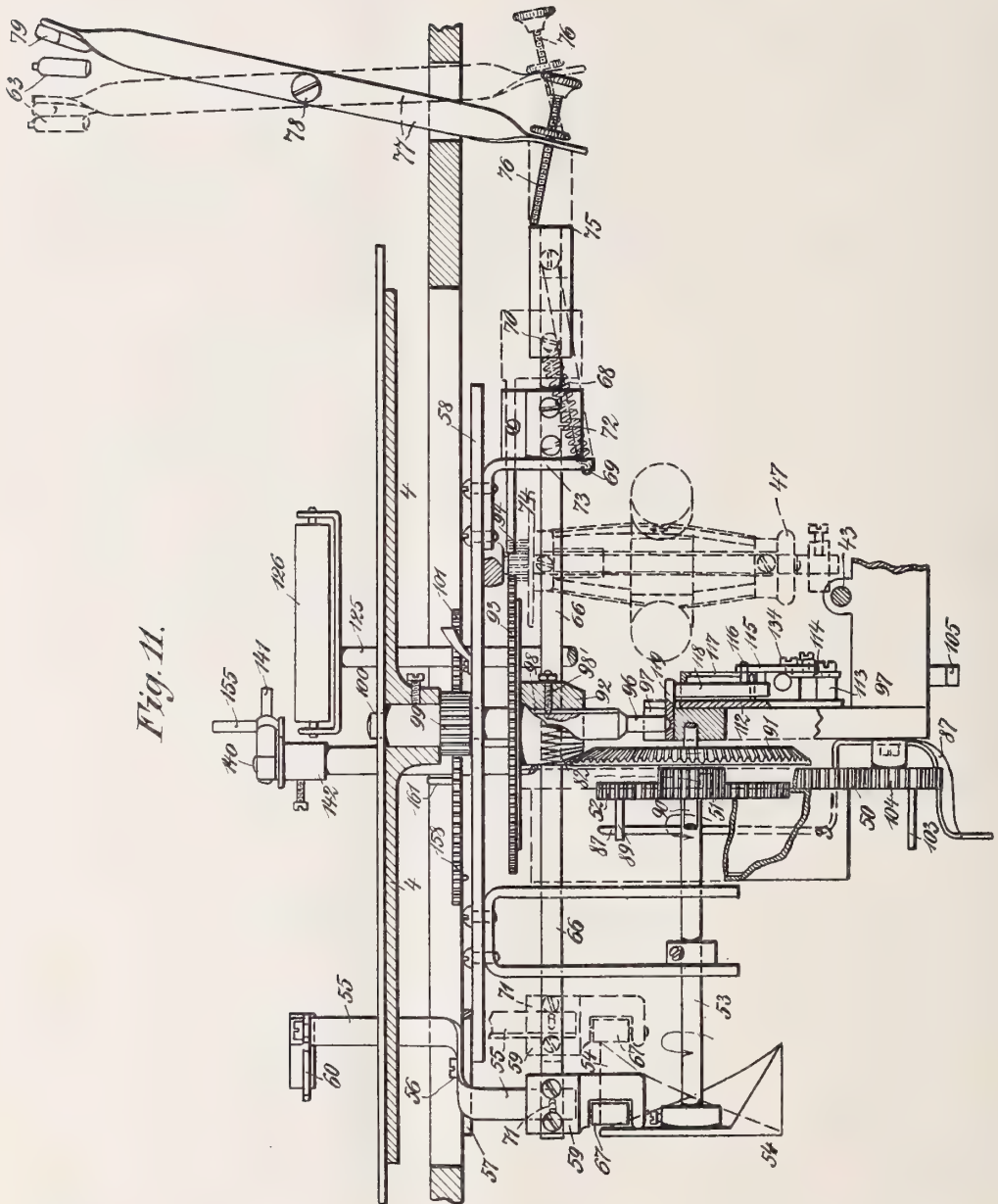


Fig. 11.

Witnesses  
F. L. Barry  
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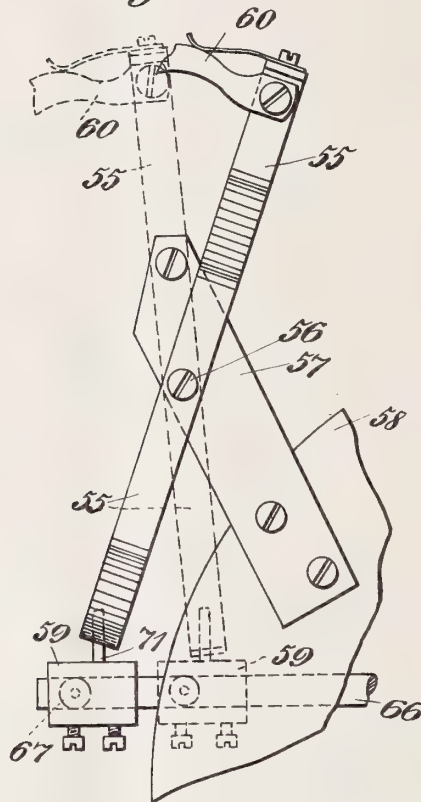


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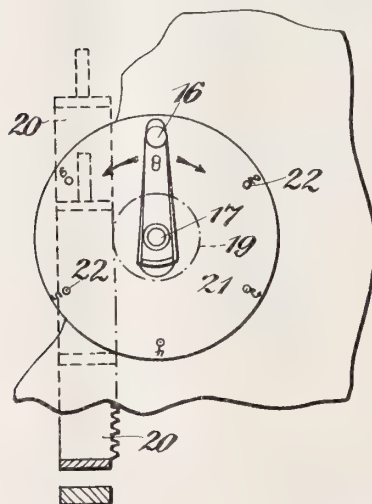
C. VOGT.  
TALKING MACHINE.  
APPLICATION FILED FEB. 6, 1906.

Patented Aug. 6, 1912.  
16 SHEETS—SHEET 10.

*Fig. 12.*



*Fig. 14.*



Witnesses  
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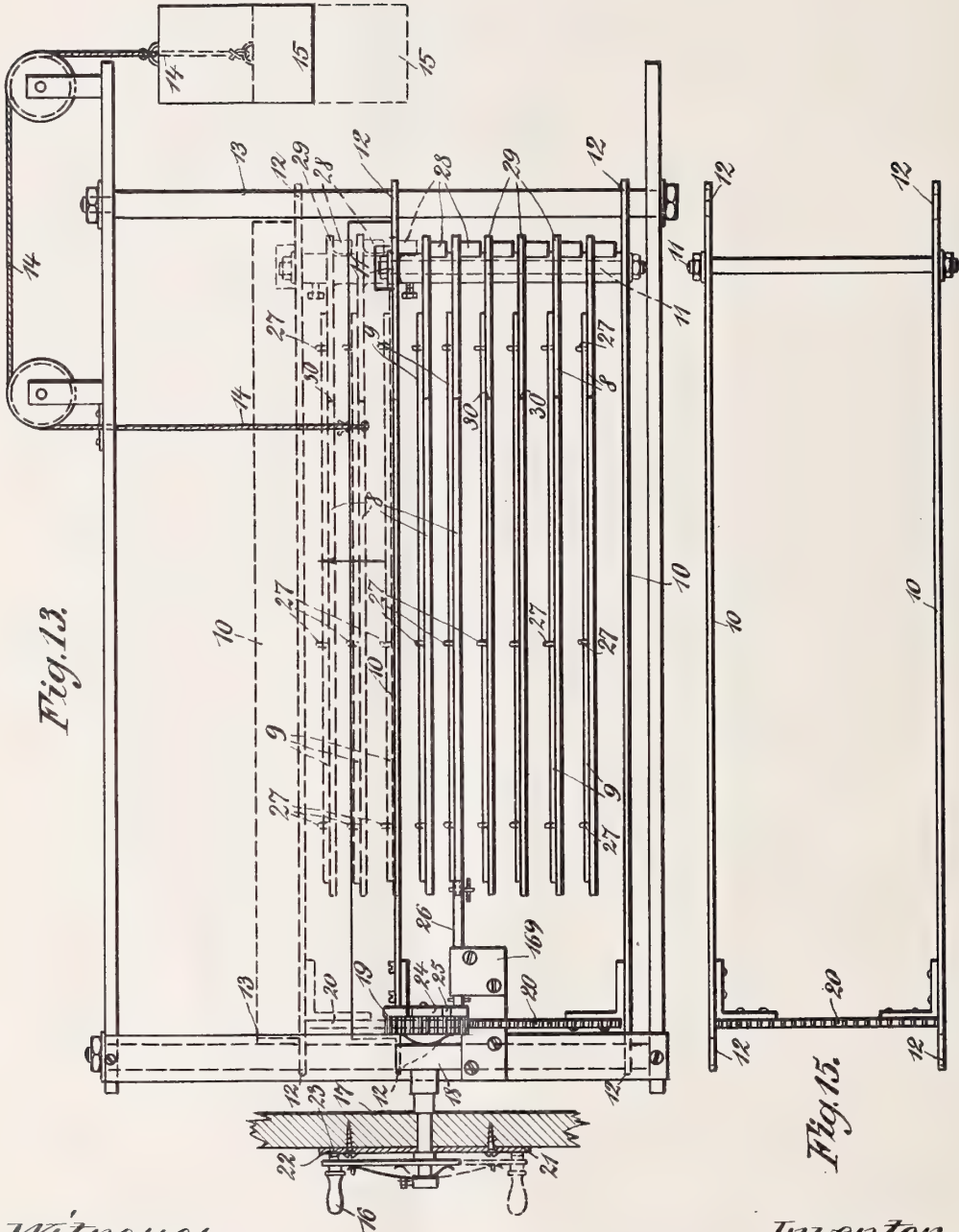
C. VOGT.  
TALKING MACHINE.

APPLICATION FILED FEB. 6, 1906.

1,034,664.

Patented Aug. 6, 1912.

16 SHEETS—SHEET 11.



Witnesses  
F. E. Barry  
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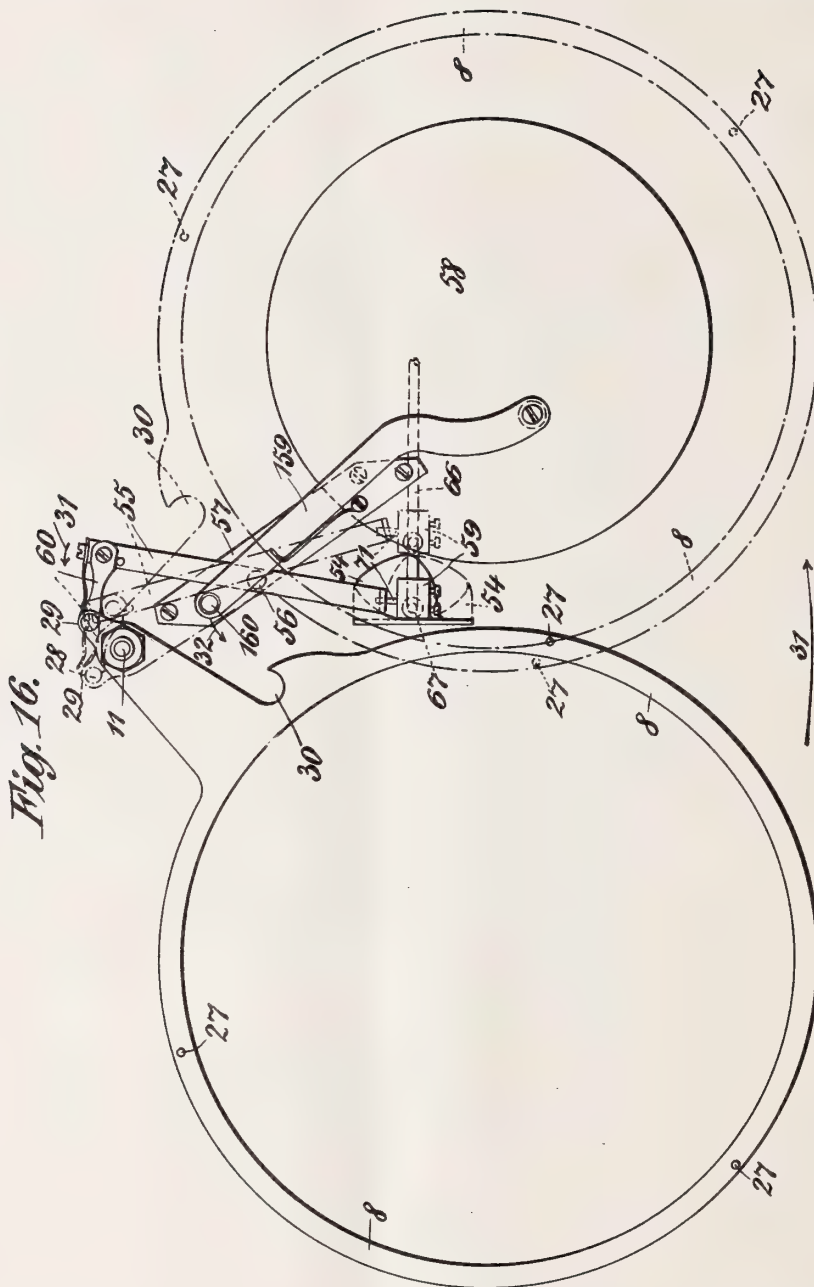
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1,034,664.

C. VOGT.  
TALKING MACHINE.  
APPLICATION FILED FEB. 6, 1906.

Patented Aug. 6, 1912.  
16 SHEETS—SHEET 12.



Witnesses  
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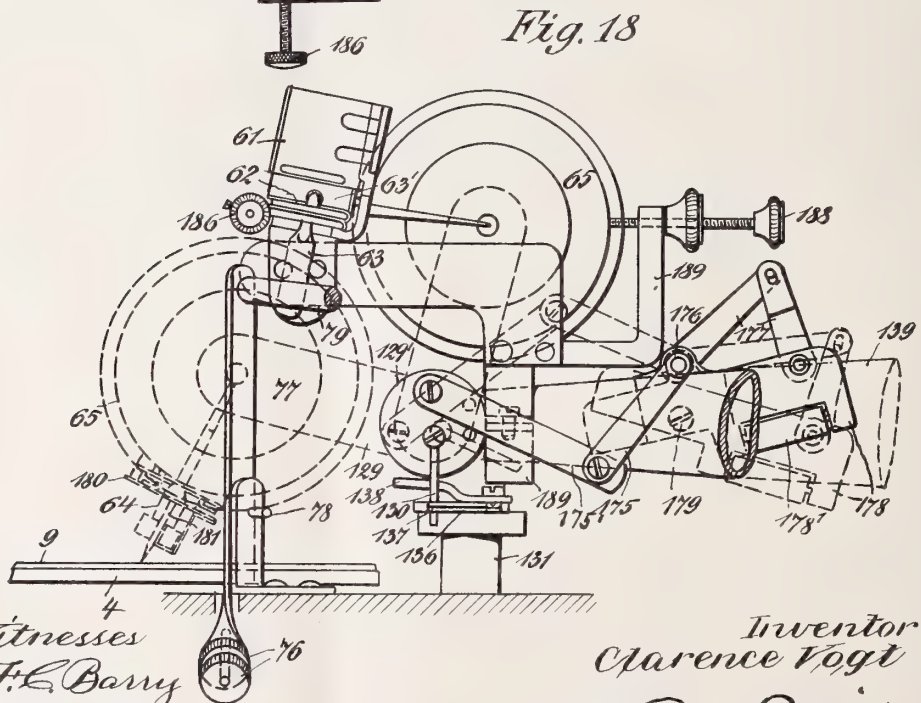
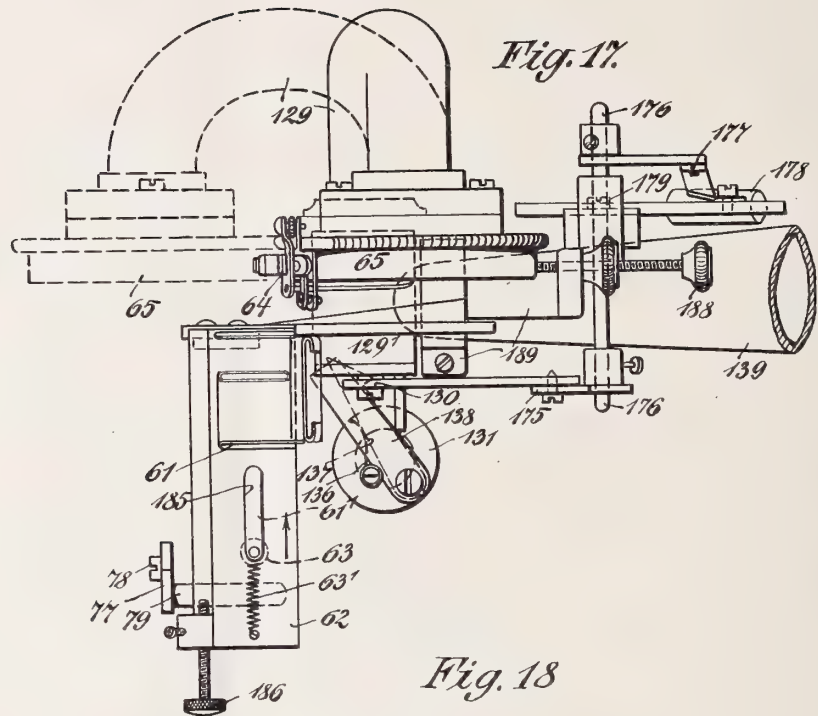


C. VOGT.  
TALKING MACHINE.  
APPLICATION FILED FEB. 6, 1906.

1,034,664.

Patented Aug. 6, 1912.

16 SHEETS—SHEET 13.



Witnesses  
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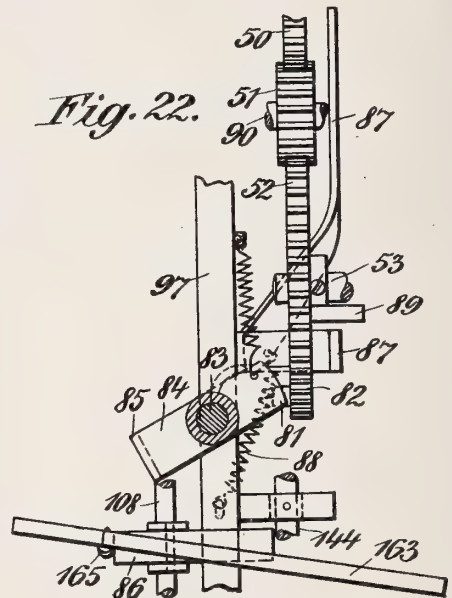
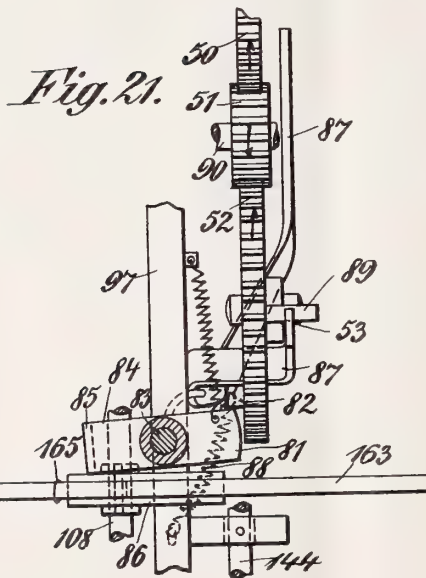
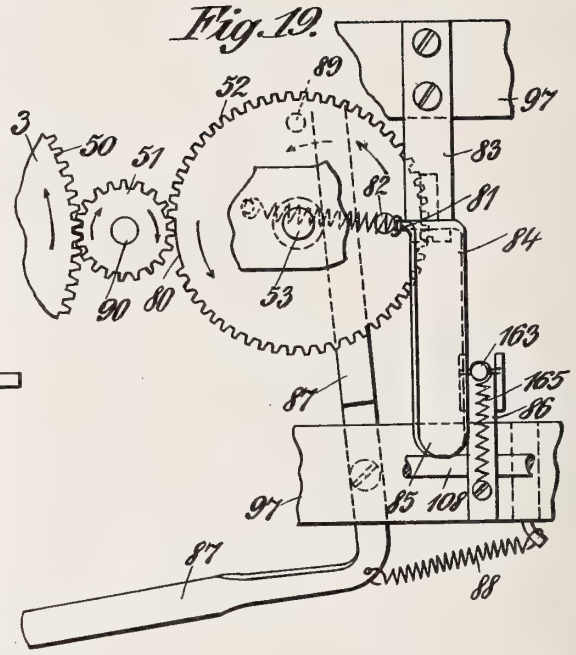
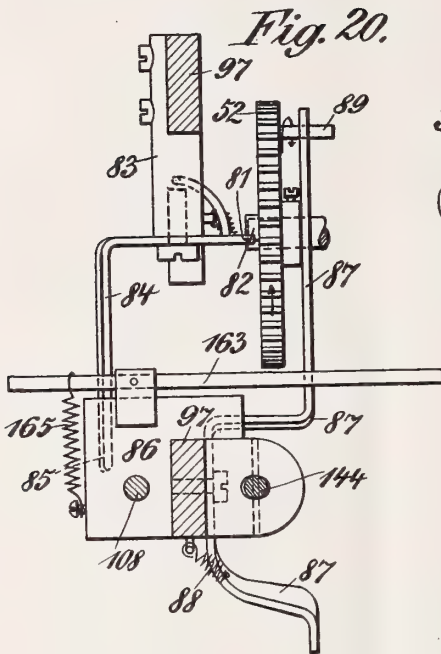
Inventor  
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1,034,664.

Patented Aug. 6, 1912.

16 SHEETS—SHEET 14.



Witnesses  
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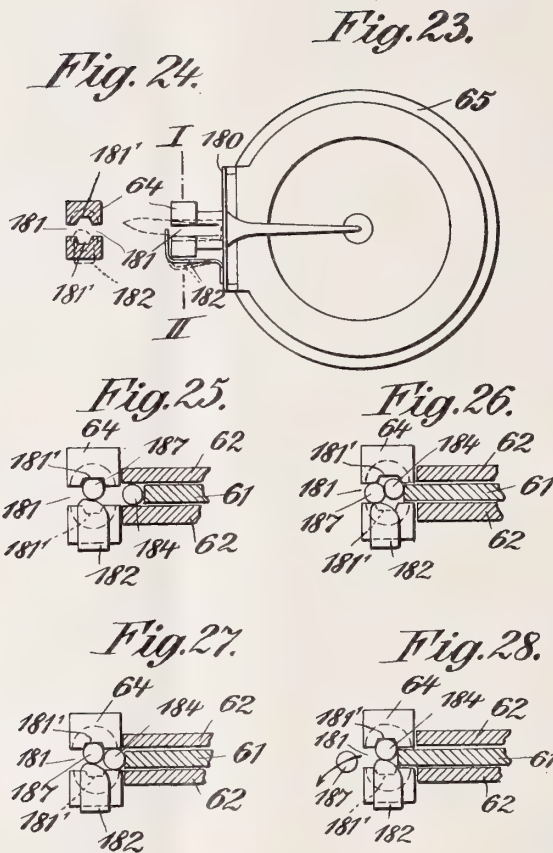
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1,034,664.

Patented Aug. 6, 1912.  
16 SHEETS—SHEET 15.

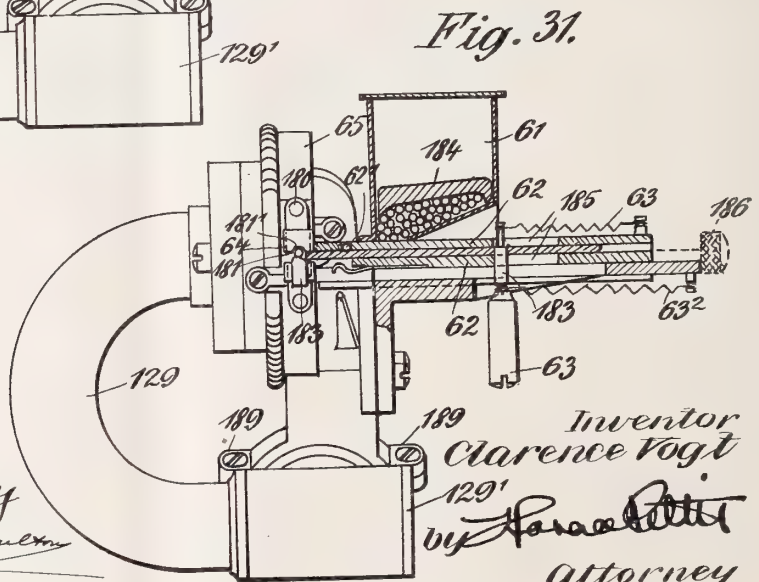
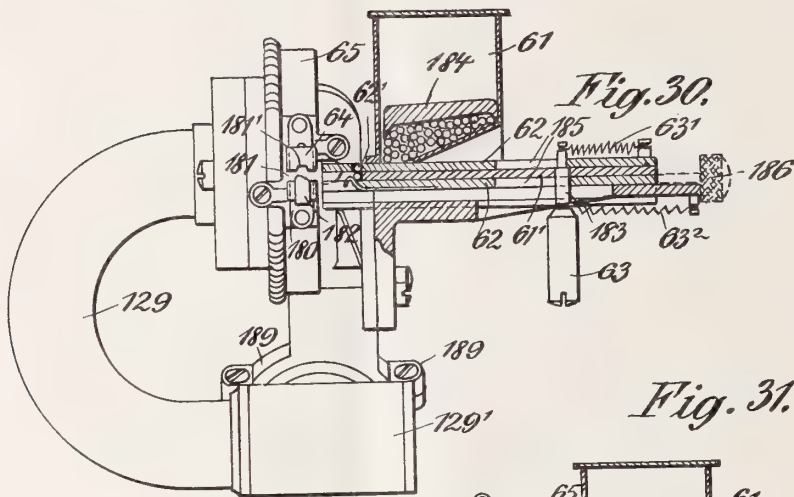
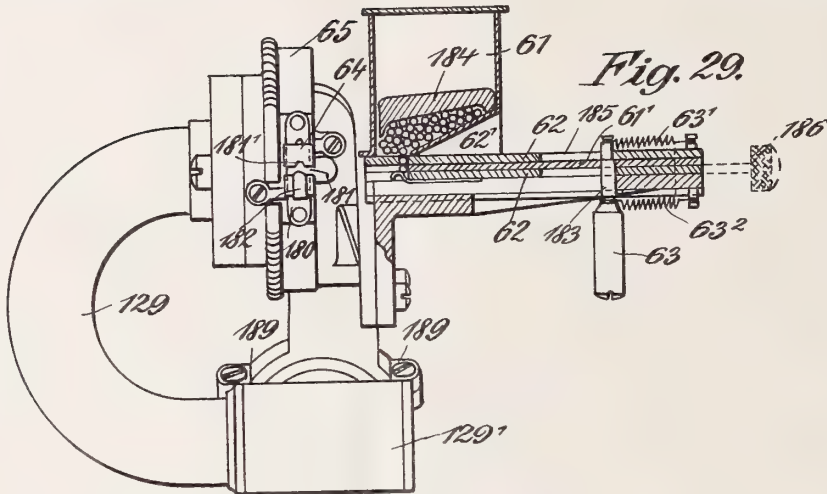


Witnesses  
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Attorney



1,034,664.



Witnesses  
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Alexander B. Moulton

Inventor  
Clarence Vogt  
by *[Signature]*  
Attorney

# UNITED STATES PATENT OFFICE.

CLARENCE VOGT, OF BERLIN, GERMANY, ASSIGNOR TO THE FIRM OF THE GRAMOPHONE & TYPEWRITER LTD., OF LONDON, ENGLAND.

## TALKING-MACHINE.

1,034,664.

Specification of Letters Patent.

Patented Aug. 6, 1912.

Application filed February 6, 1906. Serial No. 299,887.

### *To all whom it may concern:*

Be it known that I, CLARENCE VOGT, a citizen of the United States of America, and residing at Berlin, in the German Empire, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

This invention relates to a coin-freed disk-talking machine with means for enabling any desired record-disk to be selected.

One important feature of the improved machine consists in the fact that the record-disks are carried by frames pivotally mounted in a storage-receptacle and that these frames can be automatically swung into and out of the receptacle by means of the driving mechanism, so as to bring them into or out of their operative position.

Another important feature of the said invention consists in the fact that the swinging out of the disk-frame can be utilized for the changing of the sound-box-needle, so that all operations of the apparatus are performed automatically.

The special form of construction of the rising and falling turntable is also important.

As regards the operation of the machine generally, an important feature consists in the fact that the use of slideways, more especially for the movement of the record-disks, is avoided and that consequently the driving power required for carrying out all the operations does not have to be very great. Moreover the record-disks can be conveniently changed, since the round frames can be made easily accessible from all sides in the storage-chamber.

Further advantages result from the whole arrangement, by reason of the certainty of sequence of the operations, due to the method adopted for disposing the several mechanisms relatively to each other.

One example of construction of the coin-freed talking machine is shown in the drawings.

Figure 1 shows the talking machine in side elevation with the side wall removed. Fig. 2 shows the same in plan, one of the disk-changing frames being shown in dotted lines in its mid-position. Fig. 3 shows in front elevation the arrangement of the parts controlling the various operations of the apparatus, the hollow radial arm, the needle-

changer, etc., being omitted. Figs. 4 and 5 show the lifting device for the turntable in two positions. Fig. 4 also shows in front elevation the device whereby the radial arm is held locked during the changing of the needles. Fig. 6 shows the operating mechanism in rear-elevation, more especially the device for controlling the elevation and depression of the sound-box. Fig. 7 shows in plan the most important of the parts occurring in Fig. 6. Figs. 8 to 10 inclusive, show the position and operation of the lever for controlling the operations of elevating and depressing the table and of elevating and depressing the sound-box in their proper sequence. Fig. 11 is a side elevation of the driving mechanism showing mainly those parts which serve for raising and lowering the turntable, for moving the disk-frames, and also for actuating the needle changer. Fig. 12 shows in plan the lever which is shown in elevation in Fig. 11, for moving the disk-frames. Fig. 13 shows the disk-changer in front elevation, and Fig. 14 shows the corresponding setting device in side elevation. Fig. 15 is a detail view of the slide carrying the movable disk-frames. Fig. 16 shows in plan a disk-frame with the corresponding parts in their inoperative and operative positions. Figs. 17 and 18 show the sound-box arm with the needle-changer and also the locking piece for the radial arm in plan and in front elevation respectively. Figs. 19 to 22 inclusive are detail views of the arrangement for controlling the actuating mechanism for the needle-changer and for throwing into and out of action the crank gear-wheel. Fig. 23 is a side elevation of the sound-box with the needle-holder. Fig. 24 is a cross-section of the holder on the line I—II, Fig. 23. Figs. 25 to 28 inclusive are diagrams illustrating the operation of changing the needles. Figs. 29 to 31 inclusive show the needle changer in section and side elevation in various positions in its operation.

In the forms of construction shown, the complete operation of the machine is composed of the following steps:—After the winding up of the talking machine, the adjustment of the record-disk and the insertion of the coin, all operations are performed automatically. The manipulation of the talking machine above mentioned may be termed the setting and release. All



operations therefore follow each other in the manner hereinafter set forth:—

1. The setting of a disk and release of the driving mechanism by the insertion of a coin.

2. The swinging of the disk-frame with the record-disk into the operative position.

3. Setting in action of the needle-changer for the purpose of simultaneously removing the needle from the sound-box after the preceding operation of the machine and inserting a new needle.

4. Raising the turntable for the purpose of removing a record-disk from its frame, in which operation it is preferable that the turntable shall be already in motion. By this means, both the removal of the record-disk is facilitated and also time is saved, so that the subsequent action of placing the needle on said disk can take place without delay.

5. Depression of the sound-box which, in the inoperative position of the talking machine, is raised. This process can directly follow that mentioned sub 4, since the record-disk rotates from the first at the normal velocity and thus no false notes can be produced by prematurely placing the sound-box in its operative position and increasing the velocity after the needle has been placed on the record-disk.

6. Releasing of the radial arm, which is held locked in its inoperative position, during the depression of the sound-box.

7. The operation proper, *i. e.*, the talking or playing, in which all controlling parts are in a position of rest.

8. Return movement of the radial arm to the initial position by the spring pushing device released by the radial arm, the sound-box being lifted and the radial arm locked again at the same time.

9. Depression of the turntable, in which operation the used record-disk again comes to rest on the outwardly swung frame.

10. Swinging back of the frame with the record-disk into the storage chamber.

11. Stoppage of the driving gear and return of the coin-release to its initial position.

12. In combination with these steps, the actuation of a separate device, which holds the record-disk-changer locked during the operation of talking or playing, can also take place, and after the completion of the talking or playing, on stoppage of the driving mechanism, this device again releases the disk-changer to permit the fresh setting of the same.

The various arrangements will be hereinafter described in the same order as that given above.

The talking machine, in the example of construction shown, is arranged in a frame with two compartments or chambers, of

which one compartment 1 serves for the reception of the supply of record-disks with their frames, while the other compartment 2 contains the talking or playing mechanism proper, as may be seen more especially from Figs. 1 and 2. The motor or the driving mechanism 3 serves for driving the turntable 4 which is arranged to turn about a vertical axis. In the form of construction shown, the motor consists of a spring which is wound up by means of a crank-handle 5, a shaft 6 and a train of gear-wheels 7.

In order to transfer the separate record-disks in the compartment 1 to the turntable 4, it is necessary to bring the various frames 8 lying one above the other, together with their record-disks 9, as they are selected, into such a position that the frame 8, the record-disk of which is to be used for the time being, lies somewhat higher than the turntable 4. The driving mechanism 3 then moves the disk-frame 8, while in this position, out of the compartment 1 into the compartment 2 and back again. For this purpose, all the disk-frames are arranged so as to be capable of turning separately about a pivot-shaft. Moreover the method of construction of the disk-changer in the compartment 1 and the method of operation when laying the record-disks on the turntable are shown in Figs. 13 to 16 inclusive and in Figs. 2 and 12 inclusive.

As shown in Fig. 15, the disk-changer consists of a slide 10, in which are arranged the disk-frames 8 one above the other. The disk-frames all swing independently of one another about a common pivot-shaft 11 on the slide 10. This slide is guided by means of the guide-eves 12 on vertical rods 13 and by a cord 14 which extends over rollers and is provided with a counterweight 15, so that it, together with the record-disks and their frames, can be held at any desired height. A raised position of the slide with the disk-frames is shown in dotted lines in Fig. 13.

1. *The adjustment of the record-disks to the height required for use for the time being.*—That is to say, the adjustment of the slide 10 is effected by turning the hand-lever 16 on the shaft 17 (Figs. 13 and 14). This shaft 17, which is mounted at 18 on the frame of the disk-changer, bears the gear-wheel 19, which engages in a rack 20 on the slide 10. By turning the crank 16, the slide 10 is thus raised or lowered. In order to permit the correct adjustment of the slide and to facilitate the selection of the record-disk to be used for talking or playing for the time being, the crank 16 can be arranged, as shown in Fig. 14, in front of an indicator-dial 21 which can be divided to correspond with the number of disks available. This is preferably effected by means of holes 22, into which a pin 23 on the elastic crank 16 can snap. The gear-wheel 19

or a wheel 24 rigidly connected therewith can be provided with openings or recesses, with which during the talking or playing a locking pin 26 (Figs. 13 and 2) comes into engagement in the manner hereinafter explained, in such a manner that the gearing 19 and 20 is locked and the use of the disk-changer during talking or playing is prevented. The number of locking apertures 25 in the wheel 24 must obviously correspond to the number of disk-frames.

As shown in Figs. 13 and 16, the separate disk-frames 8 consist of rings, which has a somewhat greater external diameter than the disks lying thereon. The record-disks are held on the rings in their exact axial position by pins 27 provided on the said rings. The internal diameter of the disk-frames is somewhat greater than the diameter of the turntable 4, in order that, by raising and lowering the said table when the outwardly swung disk-frame is positioned axially above it, the disk 9 can be removed from its frame 8 and again deposited thereon. During the talking or playing, the disk-frame, swung outwardly for the time being, remains in this position, since the shaft of the turntable 4 extending through it would prevent it from being swung back.

The swinging outwardly and back of the separate disk-frames may advantageously take place by a push or a pull. In the form of construction shown, the disk-frames are provided, for the purpose of swinging them outwardly, with a knob 28, which is arranged on an extension 29 of the disk-frame projecting beyond the pivot shaft, and for the purpose of swinging them back, with a cam-shaped recess 30 on the opposite side of the pivot-shaft to the knob 28. Accordingly if pressure be exerted alternately at the places 28 and 30 in the direction of the arrows 31 and 32 shown in Fig. 16, the disk-frame will be thereby moved in one or the other direction about the shaft 11 in order to swing it outwardly or inwardly. The terminal positions (in the compartments 1 and 2) are determined by stops 33 and 34, in which arrangement, the stop 33 serves for insuring that the record-disk on the swung out frame shall be in the correct position over its fastening pins on the turntable 4.

The winding up of the driving mechanism can take place before or after the insertion of the coin. In this operation, the arrangement may be such that a single winding up is sufficient for a large number of complete operations of the machine. Instead of the spring driving mechanism, an electromotor or any other suitable driving apparatus can be provided, since the setting into and out of action of the motor is entirely independent of the method of supplying power thereto. In the example shown, the winding up

of the spring motor 3 is effected by turning the shaft 6, which acts by means of the train of gearing 7 on the spring. To the shaft 6 is moreover connected a locking device 6', which in a known manner permits the turning of the winding up shaft 6 in one direction only and at the same time secures the tensioned spring against running down, Figs. 3 and 4.

The coin-release can be of any desired kind. In the form of construction illustrated in Fig. 2, 6 and 7, the coin-pocket 41 is arranged beneath the coin-slot 40 on the arm 42 of the releasing rod 43. After the insertion of a coin by pressing the knob 44, the rod 43 is moved in the direction of the arrow 45 (Fig. 7) by means of the coin, so as to cause the striking piece 46 to release the locking pin 48 on the governor 47, and allow the driving mechanism to run. There now follows:—

2. *The swinging out of the disk-frame with the record-disk into the operative position.*—As shown more especially in Figs. 6, 7, 11 and, in relation to the whole arrangement, also in Fig. 2, the toothed wheel 50 connected to the motor 3 drives the shaft 53 through the intermediate wheel 51 and the gear-wheel 52, see Figs. 9 and 10. The shaft 53 bears at one end the cam-disk 54 which acts on a two-armed lever 55 oscillating about, which pin. The pivot-pin 56 is arranged on an arm 57 attached to the frame-plate 58. One arm of the lever 55 is connected to the head 59 which is mounted on a longitudinally movable rod 66. The head 59 is itself pressed against the cam-disk 54 through its roller 67 by means of a spring 68, which is attached at one end, 69, to a part of the frame 58 and engages at the other end, 70, with the rod 66. This rod 66 also serves in the manner hereinafter described for actuating the needle-changer. The head 59 is connected to the reversing lever 55 through a pin 71. On the other arm of the lever 55, there is a spring presser or pawl 60, which on the outward swing of the lever is pressed against the knob 28 of one of the disk-frames 8. The dimensions of the cam-wheel 54 are such that the outward swing of the lever 55 takes place directly after the setting in action of the main driving-mechanism 3. By this means, the roller 67 with the head 59 moves out of the position shown in full lines in Fig. 11 into that shown in dotted lines. By the corresponding oscillation of the lever 55, a disk-frame 8 is turned about the shaft 11 and brought into the operative position over the turntable 4. A mid-position of the disk-frame is shown in dotted lines in Fig 2, while Fig. 16 also shows the operative position after the outward swing is completed.

Simultaneously with the outward swing



of the disk-frame into the operative position, there takes place, in the example of construction shown,

3. *The setting in operation of the needle-changer.*—The needle-changer itself can be of any desired construction, but before that employed in the present example of construction is more fully described, the special construction of the needle-holder on the sound-box coacting therewith may be explained. It is advantageous to arrange the needle-holder in such a manner that the ejection of the needle, remaining in the needle-holder from the previous operation of the machine, takes place simultaneously with the injection of the new needle, by means of the slide of the needle changer. Accordingly, as can be seen from Figs. 23 and 24, the needle-holder 64, which in the example shown is movably attached to the sound-box 65, by means of the piece 180 with knife-edge support, is provided with a slot 181 extending through it for the introduction of the needle. In this longitudinal slot 181 are grooves 181' into which the needle is pressed by means of a spring 182 mounted on the piece 180. The spring 182 has its corners rounded at the end turned toward the slot 181 so that, on the one hand the insertion of a new needle is facilitated while on the other hand a sharp ejection of the already used needle is permitted on the opposite side. In the operative position of the sound-box 65 shown in dotted lines in Fig. 18, the needle is held obliquely in the grooves 181' of the slot 181 by the weight of the sound-box aided by the spring 182. This form of needle-holder provided with a longitudinal slot extending through it, is adapted for use with the needle-changer hereinafter described.

Care must be taken that the slide 61' of the needle-changer (the special function of which is to inject the new needle and eject the used one) shall be guided in the needle-changer by means of a pin 183 and its forward motion shall be limited in such a manner that the freshly introduced needle is not pushed beyond the correct normal position in the holder. On the slide 61' (i. e., on the pin 183) is mounted a pin 63, with which the needle-changer rod of the driving mechanism engages. Spiral springs 63', and 63<sup>2</sup>, connected to the pin 183, tend to keep the slide 61' continuously in the position of rest shown in Fig. 29.

On the frame of the needle-changer is detachably mounted the needle-magazine 61 containing the needles 184. The slide-piece 62, which is movable on the needle-changer frame and which serves as a guide for the slide 61', receives in its slot 62' the needles 184 from the magazine 61 and holds them ready for the slide (Fig. 29). And by reason of the action of the spring 63', the slide-

piece 62 is carried along by the pin 183, guided in a longitudinal slot 185 in the said slide-piece, until its adjustable screw-stop 186 (Fig. 18) abuts against the frame and prevents further motion of the slide-piece (Fig. 30). The slide-piece 62 is here conducted to the needle-holder 64, so that in the further motion of the slide 61' which is still unlimited, a fresh needle 184 can be introduced into one side of the longitudinal slot 181 of the needle-holder 64 and at the same time the previously used needle 187 pushed out.

The slide is limited in its forward motion by the pin 183 abutting against one end of the slot 185. The dimensions of the slot 185 are made such that pushing of the new needle beyond the normal position is prevented. The automatic return of the slide 61', and also of the slide-piece 62 is effected by the springs 63' and 63<sup>2</sup>. It is necessary that the radial arm 139 with the sound-box arm 129 and the sound-box 65 be held locked from motion during the changing of the needles. This is effected by means of a locking device as hereinafter explained.

The various positions of the needle during the insertion and changing by means of the slide 61' are given in the diagrammatic views in Figs. 25 to 28 inclusive.

In the position shown in Fig. 25, which corresponds approximately to Fig. 30, a new needle 184 is in the slide-piece 62 of the needle-changer on the way to the needle-holder 64, while the previously used needle 187 is still in the clamping grooves 181' of the slot 181. The slide-piece 62 has reached its end position and the changing of the needle begins. Fig. 26 shows the position of the two needles directly before the changing; the slide 61': having already moved on and the needle 184 having entered one half of the slot 181, so that it touches the one previously used. If now, as shown in Fig. 27, the forward motion of the slide is continued, the new needle forces the previously used one 187 out of the clamping grooves 181' at the same time bending the spring 182 and enters at this place as shown in Fig. 28. The rounded spring 182 flying back into the position shown in Fig. 25, here causes the used needle 187 to be forcibly ejected from the slot 181. When this has taken place, the slide 61' and the slide-piece can return to their initial positions, as shown in Figs. 25 and 29.

The motion of the slide 61' in the direction of the arrow, Fig. 17, is effected by means of the rod 66 which is moved in a longitudinal direction by means of the cam-disk 54, Fig. 11.

The rod 66, it may be mentioned here, is provided with a rectilinear guide 72, which limits the motion of the rod in one direction

by striking against a stop 73 mounted on the frame plate 58 and, by means of a guide-pin 74, prevents the rod 66 from turning, for which purpose the pin 74 may be guided  
 5 in a recess in the stop 73. The rod 66 acts at its thickened end 75 against an adjustable striking-screw 76 on the two-armed lever 77, which lever is pivoted at 78 and the upper arm 79 thereof arranged to act  
 10 on the head 63 of the needle-changer-slide. When the rod 66 is moved out of the position shown in full lines in Fig. 11 into that shown in dotted lines, the head 63 with the slide 61' is moved in such a manner that  
 15 the injection of a new needle and the simultaneous ejection of the one previously used takes place, in which operation the action of the lever 77 can be regulated to a nicety by adjusting the striking-screw 76. The  
 20 cam-disk 54 is so shaped that the rod 66 and the head 59 thereof return to their initial positions after the changing of the needles.

The rod 66 moving the needle-changer has fulfilled its task as regards the changing  
 25 of the needles as soon as the cam-disk 54 has made one revolution. In order that there may not be a continuous reciprocation of this rod during the operation of the machine by reason of the continued rotation  
 30 of the shaft 53 with the cam-disk 54, the driving of the shaft 53 must be interrupted. This is effected by uncoupling the driving wheel 52 from the main driving wheel 50  
 35 after the needle has been changed. For this purpose, the wheel 52 is mutilated and at one part of its periphery has a segment 80 throughout which the teeth are removed, which segment during the talking or play-  
 40 ing lies opposite to the intermediate driving wheel 51. The construction and method of operation of this arrangement can be seen from Figs. 6 and 11 on the one hand,  
 45 and also from the detail views, Figs. 19 to 22 inclusive. Fig. 19 shows the driving wheel 52 with the apparatus out of oper-  
 50 ation in position for commencing the next operation of the machine. After the setting in action of the motor 3, the driving wheels turn in the direction of the arrows,  
 55 and the driving of the shaft 53 takes place directly after the driving mechanism is set in action.

On the driving wheel 52, there is provided a striking piece 82, as shown in Fig. 19.  
 55 Moreover, in addition to the driving wheel, a locking device coacting with this striking piece is provided which locking device is alternately thrown into and out of action. The throwing out of action of said locking  
 60 device is effected by means of the part 86 of the main rod to be hereinafter described. Shortly after the commencement of the operation, and after the driving wheel 52 has made the greater part of its revolution and  
 65 the needle-changer has been set in motion,

the stop 82 strikes against the locking piece 81 of the piece 84 (Fig. 22), which is capable of turning about the vertical shaft 83 and against the other end 85 of which the previously mentioned part 86 can act. By this  
 70 locking device, the further motion of the driving wheel 52 is arrested, since at the same time the recessed part 80 has come in front of the intermediate wheel 51.

The driving-wheel 52 mounted on the  
 75 shaft 53 is thus thrown out of gear with the wheel 51, in which position it remains during the whole operation of talking or playing. In order that the driving wheel 52 may be in the position shown in Fig. 19 ready to  
 80 work at the beginning of the next operation of the machine, care must be taken that, on the completion of the talking or playing, on the one hand, the locking device 81, 82 is  
 85 thrown out of action again, and on the other hand, the wheel 52 is turned so far that it is again in engagement with the intermediate wheel 51. This is effected in the form of  
 construction shown, by means of a lever 87 which is also employed for other purposes  
 90 as hereinafter described. This lever is drawn by means of a spring 88 in such a direction against a striking piece 89 on the  
 driving wheel 52, that the spring-pressure tends to turn the driving wheel 52, in the  
 95 direction of the arrow (Figs. 19 and 9). If, therefore, the locking device releases so that the locking piece 84 is turned about its axis 83 by pressure of the part 86 against the  
 100 lower end 85, the spring 88 by means of the lever 87 effects the further motion and the reengagement of the driving wheel 52 with the intermediate wheel 51. This takes place  
 105 after completion of the talking or playing when the main rod is drawn back under the action of its driving crank in the manner hereinafter described.

After the swinging out of a disk-frame with its record-disk, there takes place simul-  
 110 taneously with the setting in action of the needle-changer,

4. *The raising of the turntable 4 for the purpose of lifting the record-disk 9 from its frame.*—After the setting in action of the  
 115 driving-mechanism 3, in the first place the toothed wheel 50 acts on the previously described intermediate wheel 51. On the shaft 90 of this intermediate wheel is mounted a bevel wheel 91 which is continuously in en-  
 120 gagement with a rotary bevel-pinion 92 arranged beneath the frame plate 58. This pinion 92 is itself combined with a gear wheel 93 which engages with the driving gear-wheel 94 (Figs. 3 and 11) of the gov-  
 125 ernor 47 and drives the latter. The frame-plate 58 and the bevel-pinion 92 are provided with bushings to receive the turntable-shaft 95. The latter, the lower pivot 96 of which is supported on the main frame  
 130 97 (Figs. 4, 5, 6, 7 and 11), is provided with



a longitudinal groove 98 (Fig. 11), which serves for the reception of a driving-pin 98' on the bevel-pinion 92. The turntable shaft 95 with the turntable 4 can therefore, by reason of the groove 98, be raised and lowered and at the same time continuously rotated, without the wheels 92 and 93 participating in such vertical motion. On the part of the shaft 95 above the frame-plate 58, there is rigidly mounted a gear-wheel 99 and above this, on the thickened part 100 of the shaft, the turntable 4 is mounted. On the frame-plate 58 itself is rotatably arranged a gear-wheel 101 (Figs. 2, 4 and 5), with which the wheel 99 comes into and out of engagement.

When the driving wheel 52 has completed the greater part of its revolution, the lever 87 is moved by the projection 89 on the wheel 52 in the direction of the arrow 102 (Figs. 6 and 9). In this movement, the lower suitably bent arm of the lever 87 strikes against a pin 103 on a gear-wheel 104 and turns the latter in such a manner that it comes into engagement with the gear-wheel 50 of the motor 3. This position is shown in Fig. 10. The gear-wheel 104 is arranged at the lower part of the main frame 97 on the shaft 103' and is provided with two gaps 104' and 104<sup>2</sup> in its teeth, of which 104' is on the gear-wheel 50 of the motor 3 in the position of rest. The gear-wheel 104 can accordingly begin its rotary motion after the lever 87 has struck against the pin 103. When this takes place, the following operations have already been performed. The governor 47 is unlocked, the frame 8 with its record-disk 9 is swung outwardly for talking or playing, a new needle is inserted by means of the needle-changer 61 into the sound-box 65, and the old needle is simultaneously removed.

In order to effect the raising and lowering of the turntable 4 by the motion of the gear-wheel 104, a crank 105 (Figs. 3, 4 and 6) is arranged on the shaft 103' on the opposite side of the main frame 97, the connecting rod 106 of which crank engages by means of a slot-guide 107 with the above mentioned main rod 108. The main rod bears on its middle part a rigid projection 109 (Figs. 4 and 5). By the rotation of the wheel 104 and the crank-gearing 105 and 106 in the direction of the arrow 110 (Fig. 3), which takes place after the throwing into coöperation the gear-wheel 104 with the gear-wheel 50, the main rod 108 is pressed by means of its projection 109 against a striking piece 111 in such a manner that the latter is carried along as far as is allowed by the crank gear-wheel 104. As soon as the gap 104<sup>2</sup> on the gear-wheel 104 reaches the gear-wheel 50, the said gear-wheel 104 is thrown out of action, so that the main

rod 108 temporarily remains in the end position shown in Fig. 5.

Between the upper and lower parts of the frame 97, a plate 112 is arranged beneath the turntable-shaft 95 (Figs. 4 and 5). On this plate, there is mounted a one-armed lever 114 capable of swinging about the pivot 113, on which lever 114 a second double-armed lever 115 is capable of oscillating. One arm of the latter is connected to a rod 118 which is capable of moving vertically and is guided by means of a pin 116 in a guide 117 in the plate 112. This rod 118 carries on its upper end a head 119 extending into a recess in the upper part of the main frame 97, on which head, preferably in a recess therein, is mounted the above-mentioned pivot 96 of the turntable shaft 95. To the lower arm of the double lever 115 is coupled a single-armed laterally movable lever 134 which, in the same manner as the double lever 115, is pivotally connected by means of a pin 119' with a rod 121 which is movable laterally in a horizontal guide 120 in the plate 112. This rod 121 is guided in the projection 109 secured to the main rod 108 and carries at its end the above mentioned striking piece 111. If, therefore, during the movement of the main rod 108 in the direction of the arrow 110 (Fig. 3), the projection 109 reaches the striking piece 111, the horizontal rod 121 is carried along with it in the same direction and the lever 114 turned about its fulcrum 113 in such a manner that the double lever 115 is likewise turned and the vertical rod 118 is raised in the guide 117. The turntable-shaft 95, mounted on the head 119 and capable of sliding in the bevel-pinion 92, is carried up in this motion so that its gear-wheel 99 is brought out of engagement with the gear-wheel 101 and the record-disk 9 lying on an outwardly swung frame 8 is removed by the turntable 4 from its frame. During this operation and directly following it, takes place

5. *The depression of the sound-box which is in the raised position while the talking machine is inoperative.*—This is effected during the movement of the main rod 108, for which purpose the said rod is provided at the opposite end to the crank with a slide block 122 on the upper surface of which rests a second slide-block 123 when in the inoperative position (Figs. 3, 6 and 7). Both blocks are provided with inclined co-acting slide surfaces 124. The upper slide-block 123 is connected to a shaft 125 which is guided vertically in bearings, and bears a transverse roller 126 supported in fork-shaped bearings (Figs. 3, 8 and 11). When the lower slide-block 122 takes up its outermost position after the movement of the main rod 108, the upper-slide-block 123 in the meantime has descended, by reason of

its weight on the inclined surface 124 of the slide-block 122.

On the slide block 122 is mounted a horizontal arm 127, bent at right angles to said block (Figs. 1, 3 and 4). This arm coacts with a pin 128 hereinafter described, in such a manner as to cause the depression of the sound-box 65 on to the record-disk 9. The sound-box-arm 129 is for this purpose provided, on the joint-piece 129', connected to the radial arm 139, with a pin 130 (Figs. 3, 4, 17 and 18), which, when the sound-box is raised, is turned perpendicularly downward (Figs. 3, 4, 17 and 18). An adjustable screw stop 188 on an arm 189, fixed to the radial arm 139, serves as a support for the raised sound-box arm 129.

On the cover 97' at the sound-box side, there is arranged a bushing 131, through which a rotary shaft 132 extends downward to the arm 127, while on the lower end of the shaft 132 there is fixed an arm 133, the pin 128 of which is drawn against the arm 127 by means of a tension spring 135. A lever 138 rigidly attached to the shaft 132 and arranged above the bushing 131 controls the descent of the sound-box-arm 129 with the sound-box 65 (Figs. 3, 4, 17 and 18). This takes place with the movement of the main rod 108 in the direction of the arrow 110. In this motion, the arm 127 on the lower slide-block 122 is moved along with the rod 108 and pressed against the pin 128 on the arm 133, so that the arm 133 is carried with it. This occurs at the same time the shaft 132, rigidly connected to the arm 133 is turned in its bushing 131, so that the lever 138 presses against the pin 130 on the sound-box-arm 129 in the direction of the arrow (Figs. 3 and 4) and thereby initiates the descent of the sound-box.

The further downward motion of the sound-box is effected by the action of gravity thereon, but a too rapid descent of the sound-box and consequent damage to the record disk by the needle is prevented in that the transverse roller 126, which is mounted on the shaft 125, connected to the upper slide-block 123, and which sinks slowly in the manner hereinbefore described, permits only a gradual descent of the sound-box-arm. For this purpose, a lever 175 pivotally mounted upon the shaft 176 on the radial arm 139 is pivotally connected by a link 175' to the joint 129' of the sound-box-arm. The shaft 176, pivotally mounted on the radial arm 139 of the lever 175, carries one end of a second lever 177 which moves on the other side of the radial arm. The free end of this lever 177 is pivotally attached by means of a link to a roller-frame 178, which is capable of turning about a pivot 179 on the radial arm 139. The roller 178' in the frame 178 rests continuously on the transverse roller 126 of the shaft 125, so that the de-

pression of the sound-box-arm can only take place gradually to correspond with the descent of the transverse roller 126.

6. The release of the radial arm, which is held locked in the inoperative position of the machine and during the changing of the needle, is effected while the sound-box 65 descends. The locking of the radial arm 139 is effected by means of a locking hook 136, which, in the raised position of the sound-box, engages the pin 130, arranged on the joint 129' of the sound-box-arm. The locking arm 136 is capable of turning freely on the bushing 131 about the shaft 132, in which movement, a spring 137, fixed to the bushing 131, provides for the engagement of the arm or hook 136 with the pin 130. If, therefore, the sound-box descends, the pin 130 comes out of range of the locking arm 136 and the way is made clear for a lateral motion of the radial arm 139. The sound-box 65 with the needle is now on the record-disk 9 and the operation proper, *i. e.*, the talking or playing, begins.

7. During the talking or playing, the position of the separate parts is as follows:—The main rod 108 with the coin-pocket 41 is pressed into the outermost position (in the direction of the arrow, Fig. 4) and the shaft 125, carrying the upper slide-block 123 and the transverse roller 126, has descended to its lowermost position. The crank-gear-wheel 104 stands with its recess 104<sup>2</sup> opposite to the gear-wheel 50 of the motor 3. The crank 105 and the connecting rod 106 coupled thereto are approximately in their extended positions (Fig. 5), and the projection 111 on the raising and lowering device for the turntable 4 lies on the projection 109 on the rod 108.

The levers 114 and 115 together with the push-rod 118, have completed their upward motion to its extreme limit and have thereby brought the turntable 4 into its highest position. The gear-wheel 52 lies with its gap 80 on the intermediate wheel 51. The double-armed lever 84—85, which is capable of turning about the vertical shaft 83, has its locking piece 81 on the locking projection 82 of the driving wheel 52 and locks the latter, while the downwardly bent arm 85 is released by the projection 86 on the main rod 108. The second striking piece 89 on the driving wheel 52 stands above the shaft 53, in which arrangement the lever 87 is drawn against the hub of the driving wheel 52 without touching the projection 89 (Fig. 19). The lower downwardly bent arm of this lever 87 is removed from the striking pin 103 of the gear wheel 104.

The lever 134 with the push-rod 121, during the talking or playing, takes up the extreme lateral position. After one revolution of the cam-disk 54, during which the changing of the needle has taken place, the disk



again takes up its initial position shown in Fig. 11, so that, by reason of the simultaneous return of the lever 77—79, the slide 61' and the slide-piece 62 of the needle-changer  
 5 (Fig. 29) under the action of their springs 63' and 63<sup>2</sup>. The outwardly swung disk frame 8, during the operation of playing or talking, lies encircling the turntable 4 carrying the record-disk 9, and is thus prevented  
 10 from returning.

The above-mentioned gear-wheel 101 rotatably mounted on the frame-plate 58 has its toothless gap in the position opposite to that shown in Fig. 2, or, in other words the gap lies during the talking or playing,  
 15 beneath the gear-wheel 99 of the raised turntable shaft 95. At the end of the talking or playing, there takes place

20 8. *The automatic return of the radial arm with the sound-box-arm into the inoperative position.*—This is effected by means of a releasing device which can be of any desired kind. That employed in the example illustrated is shown in its relation to the general  
 25 arrangement in Fig. 2, and its detailed construction can be seen from Figs. 6 and 7. The return motion itself is initiated by the positive guiding of the sound-box-needle in the sound-wave groove of the record-disk at the end of the talking or playing. In this  
 30 operation, the radial arm 139 strikes against a lever-arm 141, rigidly attached to a vertically mounted releasing shaft 140. This shaft 140, which is mounted in a second  
 35 outer shaft 142, is provided at the lower end with a pin 143 (Figs. 6 and 7), which engages in a piece 145 on a horizontal rod 144, capable of swinging laterally thereto on the  
 40 frame 97 (Figs. 3, 4, 6 and 7). Therefore, as soon as the radial arm 139 abuts against the short lever-arm 141 and carries the latter with it, at the same time turning the inner  
 45 shaft 140, the rod 144, as can be seen from Fig. 7, is swung in the direction of the arrow 146 by means of the piece 145. The rod 144 is connected at the other end by  
 50 means of a guide-slot with a pin 147 which extends through the frame 97 and is provided with a head at each end (Figs. 6 and 7). This pin 147 (which is shown in dotted  
 55 lines in Fig. 7 in the inoperative position of the apparatus and which in the operative position, when the crank is in the opposite position to Fig. 7, viz., in Fig. 5, arrests  
 60 the motion of the main rod 108 by extending into the path of the crank 105) is drawn away by the above-described swinging of the rod 144 from beneath the crank 105.  
 65 This crank 105, which is now free, falls by its own weight through such a distance that the gear-wheel 104 again comes into engagement with the gear-wheel 50 of the motor 3 which is in operation. The crank 105 and  
 connecting-rod 106 now perform the second

part of their respective motions in order to return the main rod 108 to its initial position. Before the radial sound conveying arm 139 is returned to its initial position, the sound-box-arm with the sound-box  
 70 must obviously be raised from the record-disk. This takes place during the return motion of the main rod 108, for which purpose the slide-block 122 returning with the  
 75 main rod 108, by means of its inclined surface 124, pushes the upper slide-block 123 with the shaft 125 up again. By this means, the transverse roller 126 on the shaft 125 is pressed against the roller 178' on the  
 80 roller frame 178, so that the sound-box-arm 129 is oscillated upwardly about its joint 129' against the stop 188 by means of the levers 175 and 177. The lower slide-block  
 85 122 bears a guide-fork 149 for a bent arm 150 which is mounted on a ring 151 at the lower end of the outer shaft 142 (Figs. 6 and 7). The arm 150 is provided with a  
 90 spiral spring 154 engaging with the projection 86 on the main rod 108, which spring continually tends to draw the arm 150 and therewith the shaft 142 in the direction of  
 95 the arrow 170 (Fig. 7). Thus, free turning of the releasing shafts 140 and 142, and also of the parts connected therewith, is prevented (Figs. 3 and 4). The tension-spring 154 also effects the return motion of  
 100 the radial arm 139 into the inoperative position, and for this purpose, the outer shaft 142 at its upper end bears a lever arm 153 having a striking piece 155 (Figs. 1, 2, 6 and 7). If now, during the return of the  
 105 main rod 108 with the lower slide-block 122, the arm 150 and therewith the outer shaft 142 are turned by the tension spring 154 in the direction of the arrow 170, Fig. 7, the lever 153 carried along therewith, by  
 110 means of its striking pin 155, effects the return of the radial arm 139 into the inoperative position in the direction of the arrow 164 (Fig. 2). The levers 153 and 141 remain in the position shown in Fig. 7, up to  
 115 the beginning of the next operation, at which time they are turned by the radial arm into the positions shown in dotted lines in order afterward to turn back in the manner hereinbefore described at the completion of the talking or playing, at the same time bringing back the radial arm to the initial position.

9. The descent of the turntable and deposition of the record-disk on to a disk-frame also take place after the completion of the talking or playing, during the return of the main rod 108 and the radial arm 139 to their initial positions. In this operation,  
 120 the projection 86 on the main rod 108 carries with it the projection 111 and thereby effects the return of the rod 121. This has for its result the drawing downwardly of the push-rod 118 in the guides 117 into the  
 130

inoperative position by means of levers 114, 115 and 134. During the descent of the push-rod 118, there also takes place the descent of the turntable and at the same time the deposition of the record-disk 9 on to the frame 8 surrounding the turntable 4.

10. The swinging back of the disk-frame with the used record-disk into the storage-receptacle follows directly upon the descent of the turntable. By the descent of the turntable-shaft 95, its gear-wheel 99 is brought into the same plane as the gear-wheel 101, pivotally mounted on the frame plate 58. Since however the gear-wheel 101 at the completion of the talking or playing has its toothless gap opposite the gear-wheel 99, the engagement of the pinion 99 with the teeth of the wheel 101 is prevented. Thus, engagement must take place between the gear-wheel 99 and the gear-wheel 101 in order to cause a movement of the latter. In this connection it may be remarked that, by the turning of the outer releasing shaft 142 into the initial position, the hooked shaped end of a spring arm 157 (Fig. 2), connected to this shaft by a pivotal joint 156, comes into engagement with a pin 158, arranged on the lower side of the gear-wheel 101, and throws the wheel 101 into gear with the pinion 99. The direction of rotation of the gear-wheel is indicated by arrows in Fig. 2. The second part of the rotation of the gear-wheel 101 now takes place. On the frame-plate 58 near the gear-wheel 101 is arranged a lever 159 which bears a contact-roller 160 at its free end, while on the gear-wheel 101 there is, moreover, secured a striking pin 161 in such a manner (Figs. 2 and 6) that, in the second half of the rotation of the gear-wheel 101, it abuts against the lever 159 and causes it to oscillate. This has for its result that the lever 159, by means of its contact-roller 160, presses against the previously described cam shaped recess 30 in the disk-frame 8 and returns the latter with the record-disk 9 into the inoperative position, as shown in Fig. 16. A spring 159' arranged beneath the lever 159 provides for the return thereof to its original position. The gear-wheel 101 is in the position shown in Fig. 2 after the swinging back of the frame. After the descent of the turntable and the swinging back of the disk-frame there takes place.

11. *The stoppage of the motor and the return of the coin-release device to its position of rest.*—The projection 86 on the rod 108 carries on its surface a rod 163 (Fig. 4 and Figs. 19 to 22 inclusive) which is pivotally-mounted in a fork and the front part of which, by means of a tension-spring 165 fixed to the projection 86, lies on a sliding and striking piece 166 fixed to the coin-release rod 43. The striking-piece 166, Figs. 4 and 7, is provided with a recess bounded

by two striking surfaces, in which rests the front part of the rod 163. During the return of the main rod 108, the striking piece 166 is accordingly carried along by means of the rod 163, so as to bring the coin-release rod 42, 43 and the coin-pocket 41 into their normal position of rest. The coin-pocket 41 now stands again under the coin-chute, so that a coin inserted through the chute can pass into the coin-pocket 41; in any other position, coins introduced are conducted past the pocket. In the return motion of the coin-release rod 42—43, the stop 46, also fixed to this rod, is brought into the path of the governor 47 and thereby the said governor is thrown out of action together with the motor 3.

12. The locking of the record-disk changer during the talking or playing is effected in the manner shown in Figs. 2, 3, and 13. By the movement of the coin-release rod 42 43 and of the coin-pocket 41, a lever 167, which is pivotally mounted on the frame-plate 58 and coupled to the coin-release device, is moved in the direction of the arrow 168 (Fig. 2), while at the other end, the lever 167 is loosely connected to the above mentioned locking pin 26. The latter is guided in a guide-piece 169 on the disk-changing frame in such a manner that, upon the release of the driving gear and by reason of the motion of the coin-releasing device connected therewith, it enters into the catch 25, corresponding to the position of the record-disk 9 in the locking disk 24. By this means, any turning of the disk-setting handle 16 or alteration of its position on the indicator disk 21 is prevented during talking or playing. The disk-changer is released by the automatic return of the coin-releasing device into its normal position of rest.

The invention can obviously be modified in its constructive details. Thus, any desired form of motor 3 can be employed, as already mentioned. The needle-changer can be constructed in such a manner that the insertion of the new needle and the removal of the one previously used are not effected simultaneously and by one device, as for example two separate devices might be employed, one of which provides for the insertion and the other for the ejection of the needle. The needle-holder does not require to be provided with a longitudinal slot extending through it, it simply being sufficient to provide an inlet-slot for the needle, arranged on one side only of the needle-seat. The ejection of the used needle would then obviously take place before the insertion of a new needle. The record-disk changing device can also be provided with separate driving mechanism, which would be thrown into and out of action in a suitable manner by the main driving mechanism.

The construction of the disk-frames them-



selves can be varied as desired, except that, when employing a rising turntable, it must always be taken into consideration that the turntable shall be able to take up the record-

5 disks and put them down again after completion of the talking or playing. The disk-changer can also be arranged in such a manner that the raising of the turntable is dispensed with, the record-disks from the suit-

10 ably-constructed changing-device being placed on an ordinary record-disk table, *i. e.*, one not movable into an elevated position and again removed therefrom after the talking or playing is completed. It is essential

15 in any case that the record-disks shall be capable of being selected and adjusted as desired and that, after the release of the driving-mechanism, and after the record-disk has been selected, all motions of the talking

20 machine up to the stoppage of the motor shall take place automatically upon the completion of the talking or playing. The word "record-disk" as used herein and in the subjoined claims should be understood as in-

25 cluding any suitable form of plate or tablet for supporting a sound-record.

What I claim and desire to protect by Letters Patent of the United States is:—

1. In a talking machine, the combination

30 with a turn table and driving mechanism, of a pivoted record carrier and support, means actuated by the driving mechanism for swinging said carrier and support in a horizontal plane into and out of position

35 over said turn table, and means for moving said table to remove a record from said carrier.

2. In a talking machine, the combination with driving mechanism, of a sound box and

40 needle changing mechanism, a storage receptacle for record disks, a carrier device for record disks, said carrier device being supported in said receptacle, means actuated by said driving mechanism to swing said

45 carrier device, and means actuated by the swinging movement of said carrier device to actuate said needle changing mechanism.

3. In a talking machine, the combination with a movable supporting frame, of rods

50 for guiding said frame upon which said frame is slidably mounted, a pivot shaft on said supporting frame, carrier frames for records pivotally mounted upon said pivot shaft, driving mechanism and means actu-

55 ated by said driving mechanism to swing said carrier frames.

4. In a talking machine, the combination with a vertically movable supporting frame, of rods guiding said frame, carrier frames

60 for record disks mounted to oscillate in horizontal planes upon said supporting frame, and means for adjusting the position of said supporting frame.

5. In a talking machine, the combination

65 with a vertically movable supporting frame,

of rods for guiding said frame, carrier frames for record disks mounted one above the other upon said supporting frame, a rack and a gear for the vertical adjustment of said supporting frame, a pivot shaft on

70 said supporting frame upon which said carrier frames are mounted to swing, driving mechanism, and means actuated by said mechanism for swinging said carrier frames.

6. In a talking machine, the combination

75 with a vertically movable supporting frame, of rods for guiding said frame, carrier frames for record disks mounted one above the other in said supporting frame, a rack and a gear wheel for adjusting said sup-

80 porting frame, an indicating device for adjusting the supporting frame in a predetermined position, a shaft on the supporting frame, said carrier frames being mounted to oscillate upon said shaft, driving mechanism

85 and means actuated by said driving mechanism for swinging said carrier frames.

7. In a talking machine, a movable supporting frame, carrier frames mounted to swing on said supporting frame, means for

90 the manual adjustment of said supporting frame in a predetermined position, driving mechanism, a brake for said driving mechanism, and a locking piece automatically actuated to lock said adjusting means during

95 the operation of sound reproduction.

8. A talking machine comprising driving mechanism, annular record frames mounted to oscillate, each of said record frames being provided with a projection and a cam shaped

100 surface on opposite sides respectively of the axis of oscillation of the said frame, and means actuated by said driving mechanism engaging alternately with one of said pro-

105 jections and one of said cam shaped surfaces to swing one of said frames into and out of position.

9. A talking machine comprising a turn table, driving mechanism, carrier frames for records mounted to swing about an axis,

110 means between said driving mechanism and said frames to swing said carrier frames over said turn table, means actuated by said driving mechanism for raising said turn

115 table after one of said carrier frames has been thrown into operative position over said turn table, for the purpose of lifting a record from said carrier frame, and means actuated by said driving mechanism for

120 lowering the turn table to redeposit the record on the carrier frame.

10. A talking machine comprising a turn table, driving mechanism, carrier frames for records mounted to oscillate, means actuated by said driving mechanism to oscillate said

125 carrier frames, a driving shaft for said turn table, levers oscillated by said driving mechanism and positively connected to the said turn table shaft for raising the turn table

130 to remove a record from one of said carrier

frames, and to lower said turn table to re-  
deposit the said record on the said carrier  
frame.

11. A talking machine comprising a turn  
5 table, driving mechanism, carrier frames for  
records mounted to oscillate over said turn  
table and actuated by said driving mecha-  
nism, a driving shaft for said turn table ac-  
tuated by said mechanism, a toggle connect-  
10 ed at one end to said driving shaft, guides  
for said toggle, a link connected to the said  
toggle, and means actuated by said driving  
mechanism for reciprocating said link for  
the purpose of raising and lowering said  
15 turn table to remove and to redeposit a re-  
cord on one of said carrier frames.

12. A talking machine comprising driv-  
ing mechanism, carrier frames for records  
mounted to oscillate, means actuated by  
20 said driving mechanism for oscillating said  
frames, a sound box, and needle changing  
mechanism for said sound box actuated by  
said driving mechanism for automatically  
inserting a new needle laterally into said  
25 sound box and for simultaneously ejecting  
a used one therefrom.

13. A talking machine comprising driv-  
ing mechanism, carrier frames for record  
disks mounted to oscillate and actuated by  
30 said driving mechanism, a needle holder,  
a needle changing device comprising a spring  
slide for pushing a new needle laterally into  
the said needle holder and simultaneously  
ejecting one therefrom, a shaft actuated by  
35 said driving mechanism, a cam disk on said  
shaft, a longitudinally movable rod actu-  
ated by said cam disk, and a lever mounted  
to oscillate and actuated by said longitudi-  
nally movable rod to move the said slide of  
40 the said needle changing device.

14. A talking machine comprising sound  
reproducing mechanism, driving mechanism  
therefor, carrier frames for records mounted  
to oscillate, a sound box and needle holder,  
45 a device for inserting a needle into the nee-  
dle holder and simultaneously ejecting one  
therefrom, a rod actuated by said driving  
mechanism for setting the needle changer  
into operation, and a toothed driving wheel  
50 provided with a gap in its teeth for actu-  
ating said rod whereby said needle changing  
mechanism remains at rest during the re-  
production of sound.

15. A talking machine comprising driv-  
ing mechanism, a carrier frame for a record  
mounted to oscillate and actuated by said  
driving mechanism, a sound box and needle  
holder, a needle changing device comprising  
a spring slide for pushing a needle into the  
60 needle holder and simultaneously ejecting  
one therefrom, a shaft actuated by the driv-  
ing mechanism, a cam disk on said shaft, a  
rod mounted to be moved longitudinally by  
said cam disk, a lever mounted to swing

about an axis and oscillated by said longi- 65  
tudinally movable rod, said lever actuating  
said slide of the needle changing device,  
and an adjusting screw mounted on said lever  
and engaging against the said rod for  
adjusting the amount of oscillation of said 70  
lever as desired.

16. A talking machine comprising driv-  
ing mechanism, a carrier device for records  
mounted to oscillate and actuated by said  
driving mechanism, a radial arm, a sound 75  
box mounted upon said arm, a needle holder  
on said sound box, needle changing mecha-  
nism actuated by said driving mechanism,  
and a locking device for the radial arm con-  
nected to the sound box for securing the 80  
radial arm during the changing of needles.

17. In a talking machine, the combination  
with a rotatable record support and driving  
mechanism therefor, of a pivoted record car- 85  
rier mounted to swing into and out of aline-  
ment with said record support and opera-  
tively connected to said driving mechanism,  
and means to move said support to remove a  
record from said carrier.

18. In a talking machine the combination 90  
with a substantially flat rotatable record  
support and driving mechanism therefor, of  
a record supporting carrier pivoted to swing  
in a plane parallel to said support and ac-  
tuated by said driving mechanism. 95

19. In a talking machine, the combina-  
tion with a rotatable record support and  
driving mechanism therefor, of an annular  
record carrier pivoted to swing into and out  
of axial alinement with said record support. 100

20. In a talking machine the combina-  
tion with a rotatable record support, and  
driving mechanism therefor, of an annular  
record carrier pivoted to swing into and out  
of axial alinement with said record support 105  
and actuated by said driving mechanism.

21. In a talking machine, the combina-  
tion with a rotatable record support, of a  
plurality of movable record carriers, and  
means for moving any one of said carriers 110  
into and out of vertical alinement with said  
record support.

22. In a talking machine the combination  
with a rotatable record support, of a plu- 115  
rality of movable record carriers arranged  
in vertical series adjacent said support, and  
means for moving any one of said carriers  
into and out of vertical alinement with said  
record support.

23. In a talking machine, the combination 120  
with a rotatable record support, of a plu-  
rality of pivoted record carriers, and means  
for moving any one of said carriers into and  
out of vertical alinement with said record  
support. 125

24. In a talking machine, the combination  
with a rotatable record support, of a plu-  
rality of pivoted carriers arranged in verti-



cal series, and means for moving any one of said carriers into and out of vertical alinement with said record support.

25. In a talking machine the combination  
5 with a substantially horizontal record turn table, of a plurality of pivoted record carriers arranged in vertical series adjacent said turn table, means to move said carriers vertically, and means to swing one of said  
10 carriers over said turn table.

26. In a talking machine the combination with a substantially horizontal record turn table, and driving mechanism therefor, of a plurality of pivoted record carriers arranged  
15 in substantially vertical series adjacent said turn table, means to move said carriers vertically and means actuated by said driving mechanism to swing one of said carriers over the turn table.

20 27. In a talking machine the combination with a plurality of movable record carriers pivoted to swing horizontally, of an index and circular index plate for adjusting said carriers vertically in a predetermined position, driving mechanism, a brake for said  
25 driving mechanism, and means actuated by the release of said brake to lock said index.

28. In a talking machine the combination with a movable record carrier, means to  
30 move said carrier, a laterally movable needle holder, and a fixed needle changing mechanism operatively connected to said moving means.

29. In a talking machine the combination  
35 with a movable supporting frame, a shaft on said frame, annular record carriers pivotally mounted on said shaft, driving mechanism and means actuated by said driving mechanism to swing one of said record carriers about its pivot.  
40

30. In a talking machine the combination with a movable supporting frame, record carriers carried by said frame, means for adjusting the position of said supporting  
45 frame, driving mechanism, and means actuated by the release of said driving mechanism for locking said frame.

31. In a talking machine, the combination with a vertically movable talking machine  
50 record supporting frame, of a vertical shaft carried by said frame, and carrier frames for removably supporting talking machine records pivoted in vertical series upon said shaft.

55 32. In a talking machine, the combination with a vertically movable supporting frame, of a vertical shaft carried by said frame, carrier frames for records pivoted in vertical series upon said shaft, driving mechanism, and means actuated by said driving  
60 mechanism for swinging said frames.

33. A talking machine comprising driving mechanism, a pivoted record frame, and two members actuated by said mechanism

and engaging said frame alternately to  
65 swing said frame in opposite directions.

34. A talking machine comprising driving mechanism, a pivoted record frame and two members actuated by said mechanism and engaging said frame alternately upon  
70 opposite sides respectively of the axis of oscillation of said frame to swing said frame in opposite directions.

35. A talking machine comprising driving mechanism, a pivoted record frame provided with a projection and a recess upon  
75 opposite sides respectively of the axis of oscillation thereof, and two members actuated by said mechanism and engaging said projection and said recess respectively  
80 to swing said frame in opposite directions.

36. A talking machine comprising a vertically movable turn table, a record carrier movable over said turn table, means for raising said turn table after said carrier  
85 frame has been moved into operative position over said turn table, to lift a record from said frame, and means for lowering the turn table to redeposit the record on the said carrier frame.  
90

37. A talking machine comprising a vertically movable turn table, driving mechanism therefor, a record carrier movable over said turn table, means actuated by said driving mechanism for raising said turn  
95 table after said carrier frame has been moved into operative position over said turn table, to lift a record from said frame, and means actuated by said driving mechanism for lowering the turn table to redeposit the  
100 record on said carrier frame.

38. A talking machine comprising driving mechanism therefor, a needle holder and needle changing mechanism comprising a spring slide actuated by said driving mechanism for pushing the needle laterally into the said needle holder and simultaneously  
105 ejecting one therefrom.

39. A talking machine comprising a turn table, and driving mechanism therefor, a  
110 radial arm mounted to swing over said turn table, a sound box pivoted to said arm, and means actuated by said driving mechanism for swinging said sound box away from said turn table and into an inverted  
115 position.

40. A talking machine comprising a turn table and driving mechanism therefor, a radial arm mounted to swing over said turn table, a sound box pivoted to said arm, means actuated by said driving mechanism for swinging said sound box away from said turn table and into an inverted position, and means actuated by said driving mechanism for returning said sound box  
125 toward said turn table.

41. A talking machine comprising a turn table, and driving mechanism therefor, a

radial arm mounted to swing over said turn table, a sound box pivoted to said arm, means actuated by said driving mechanism for swinging said sound box away from said turn table and into an inverted position, means actuated by said driving mechanism for returning said sound box toward said turn table, and needle changing mechanism arranged to be in operative position when said sound box is in its inverted position.

42. A talking machine comprising a turn table and driving mechanism therefor, a radial arm mounted to swing over said turn table, a sound box pivoted to said arm, means actuated by said driving mechanism for swinging said sound box away from said turn table and into an inverted position, means actuated by said driving mechanism for returning said sound box toward said turn table, and means for locking said sound box when in its inverted position.

43. A talking machine comprising a turn table and driving mechanism therefor, a radial arm mounted to swing over said turn table, a sound box pivoted to said arm, means actuated by said driving mechanism for swinging said sound box away from said turn table and into an inverted position, means actuated by said driving mechanism for returning said sound box toward said turn table, needle changing mechanism arranged to be in operative position when said sound box is in its inverted position, means for locking said sound box when in its inverted position, and means actuated by the downward movement of said sound box for releasing the same from said locking means.

44. A talking machine comprising a turn table and driving mechanism therefor, a radial arm mounted to swing over said turn table, a sound box carried by said arm, needle changing mechanism, means actuated by said driving mechanism for bringing said sound box into operative position with respect to said needle changing mechanism, means for automatically locking said sound box in said operative position, means between said needle changing mechanism and said driving mechanism whereby said needle changing mechanism is caused to operate when said sound box is in its locked position, and means actuated by said driving mechanism for releasing said sound box from locked engagement after said needle changing mechanism has been operated, and to bring said sound box into operative position with respect to said turn table for the reproduction of sound.

45. In a talking machine, the combination with a turntable and driving mechanism therefor, of a pivoted record carrier, a record upon said carrier, means actuated by the driving mechanism for swinging said carrier and record in unison, and means for

moving said turntable to remove the record from the carrier.

46. In a talking machine, a vertically movable supporting frame, carrier frames for records mounted to swing horizontally on said supporting frame, means for the adjustment of said supporting frame vertically, driving mechanism, and a locking piece actuated by the release of said driving mechanism for locking said adjusting means during the operation of sound reproducing.

47. A talking machine comprising driving mechanism, a sound box, and needle changing mechanism for said sound box actuated by said driving mechanism for automatically inserting a needle laterally into said sound box.

48. A talking machine comprising driving mechanism, a sound box, and needle changing mechanism for said sound box actuated by said driving mechanism for automatically inserting a needle laterally into said sound box, and for simultaneously ejecting one therefrom.

49. A talking machine comprising driving mechanism, a needle holder, a needle changing device comprising a slide for pushing a needle laterally into the said needle holder and simultaneously ejecting one therefrom, a shaft actuated by said driving mechanism, a cam disk on said shaft, a longitudinally movable rod actuated by said cam disk, and a lever mounted to oscillate and actuated by said longitudinally movable rod to move the said slide of the said needle changing device.

50. In a talking machine, the combination with a rotatable record support and driving mechanism therefor, of a pivoted annular record carrier mounted to be swung into and out of alinement with said record support by said driving mechanism.

51. In a talking machine, the combination with a rotatable turntable and driving mechanism therefor, of an annular pivoted record carrier mounted to swing into and out of axial alinement with the said turntable, and means actuated by said driving mechanism for swinging said carrier.

52. In a talking machine, the combination with a substantially flat rotatable turntable and driving mechanism therefor, of an annular record carrier pivoted to swing in a plane substantially parallel with a plane of said turntable, and means actuated by said driving mechanism to swing said carrier.

53. In a talking machine, the combination with a rotatable turn table, of a plurality of movable record carriers, and means for moving any one of said carriers into and out of axial alinement with said turntable.

54. In a talking machine, the combination with a rotatable record support, of a plurality of movable record carriers arranged in



- vertical series adjacent said support, and means for moving any one of said carriers independently of the remaining carriers into and out of a predetermined position with respect to said support.
55. In a talking machine, the combination with a rotatable record support, of a plurality of record carriers, and means for moving any one of said carriers into and out of a predetermined position above said support.
56. In a talking machine, the combination with a turntable, of a plurality of pivoted record carriers arranged in vertical series adjacent to said turntable, means to move said carriers vertically in unison, and means to swing any one of said carriers upon its pivot.
57. In a talking machine, the combination with a turntable and driving mechanism therefor, of a plurality of pivoted record carriers arranged in substantially vertical series adjacent said turntable, means to move said carriers vertically in unison, and means actuated by said driving mechanism to swing any one of said carriers upon its pivot.
58. In a talking machine, the combination with a record support, of a vertically movable vertical shaft, record carriers pivotally mounted on said shaft, driving mechanism, and means actuated by said driving mechanism to swing any one of said carriers about said shaft.
59. In a talking machine, the combination with a longitudinally movable shaft, of annular record carriers mounted to oscillate on said shaft, driving mechanism, and means actuated by said driving mechanism to swing any one of said carriers about said shaft.
60. In a talking machine, the combination with a record support, of a vertically movable supporting frame, record carriers each adapted to form the sole support for a record, and pivoted to said frame to swing horizontally, and means for adjusting the vertical position of said frame.
61. In a talking machine, the combination with a record support and driving mechanism therefor, of a record carrier, and means actuated by said driving mechanism for moving said support to remove a record from said carrier.
62. In a talking machine, the combination with a record support and driving mechanism therefor, of a record carrier and means actuated by said driving mechanism for moving said support to deposit a record upon said carrier.
63. In a talking machine, the combination with a record support and driving mechanism therefor, of a record carrier, and means actuated by said driving mechanism for moving said support to remove a record from said carrier and to re-deposit the same thereon.
64. In a talking machine, the combination with a record support, and driving mechanism therefor, of an annular record carrier, and means actuated by the driving mechanism for moving said support to remove a record from said carrier.
65. In a talking machine, the combination with a record support and driving mechanism therefor, of a record carrier actuated by said driving mechanism to move into and out of alinement with said record support, and means actuated by said driving mechanism for moving said support to remove a record from said carrier.
66. In a talking machine, the combination with a record support and driving mechanism therefor, of a record carrier actuated by said driving mechanism to move into and out of alinement with the said support, and means actuated by said driving mechanism for moving said support to deposit a record upon said carrier.
67. In a talking machine, the combination with driving mechanism, of a radial arm, a sound box mounted upon said arm, a needle holder on said box and needle changing mechanism actuated by said driving mechanism to insert a needle laterally into said holder.
68. In a talking machine, the combination with a record support and driving mechanism therefor, of a radial arm mounted to swing over said record support, a sound box mounted upon said arm, means actuated by said driving mechanism for swinging said sound box away from said support and into an inverted position, and means for automatically locking said sound box when in its inverted position.
69. In a talking machine, the combination with a record support and driving mechanism therefor, of a radial arm mounted to swing over said record support in a fixed plane, a sound box mounted upon said arm, means actuated by said driving mechanism for swinging said sound box away from said support and into an inverted position, and means for automatically locking said sound box when in its inverted position.
70. In a talking machine, the combination with a radial arm, of a sound box pivoted to said arm to be swung into an inverted position thereon, and means for automatically locking said sound box when in its inverted position.
71. In a talking machine, the combination with a record support, of a radial arm mounted to swing over said support, a sound box mounted upon said arm to swing toward and away from said support, and means actuated by the movement of said box away from said support to lock said radial arm in a fixed position.
72. In a talking machine, the combination with a record support, of a radial arm

mounted to swing over said support in a fixed plane, a sound box mounted upon said arm to swing toward and away from said support, and means actuated by the movement of said box away from said support to lock said radial arm in a fixed position.

73. In a talking machine, the combination with a record support, of a radial arm mounted to swing over said support, a sound box mounted upon said arm to swing toward and away from said support, and means actuated by the movement of said box away from said support to lock said radial arm in a fixed position, said arm being released from locking engagement by the opposite movement of said box.

74. In a talking machine, the combination with a record support and driving mechanism therefor, of a radial arm, a sound box mounted upon said arm to swing toward and away from said support, means actuated by said driving mechanism for swinging said box away from said support, and means actuated by the movement of said sound box away from said support for automatically locking the same, said means comprising a member carried by said sound box and a member yieldingly mounted upon a fixed support.

75. In a talking machine, the combination with a radial arm restrained to swing in a fixed plane for carrying a stylus needle, of a locking device for said radial arm, comprising a member carried by said arm, and a member mounted upon a fixed support, one of said members being yielding.

76. In a talking machine, the combination with a record support, of driving mechanism, a needle holder, needle changing mechanism, a movable record carrier, and means actuated by said driving mechanism for simultaneously moving said carrier toward said support and for actuating said needle changing mechanism.

77. In a talking machine, the combination with a record support, of a record carrier comprising a frame having an opening adapted to receive said support, said frame being mounted to swing into and out of alinement with said support.

78. In a talking machine, the combination with a record support, of a record carrier comprising a frame having an opening adapted to receive said support, said frame being mounted to swing into and out of alinement with said support, and means to cause said support to pass into said opening.

79. In a talking machine, the combination with a record support, of driving mechanism, a radial arm mounted to swing in a fixed plane with respect to said support, a sound box mounted upon said arm, needle changing mechanism at one end of the path of the free end of said arm, means actuated by said mechanism for swinging said sound

box with respect to said arm at the other end of said path and for returning said arm over its path to bring said sound box in operative position with respect to said needle changing mechanism.

80. In a talking machine, the combination of a laterally movable sound conducting device, a sound box connected thereto, and means to prevent the lateral movement of the said sound conducting device and said sound box when the talking machine is not in operation, said means being thrown automatically out of operation at the beginning of the operation of the machine.

81. In a talking machine, the combination with driving mechanism, of a movable needle holder, and stationary needle changing mechanism actuated by said driving mechanism for inserting a needle laterally into said holder.

82. In a talking machine, the combination with driving mechanism, of a needle holder, and needle changing mechanism having an element actuated by said driving mechanism for positively pushing a needle laterally into said holder.

83. In a talking machine, the combination with driving mechanism of a swinging sound box, and stationary needle changing mechanism for said sound box actuated by said driving mechanism for automatically inserting a needle into said sound box from one side thereof.

84. In a talking machine, the combination with driving mechanism, of a movable record carrier, and two members actuated by said driving mechanism and engaging said carrier alternately to move said carrier in opposite directions respectively.

85. In a talking machine, the combination with a record carrier mounted to oscillate, of two members engaging said carrier alternately upon opposite sides respectively of the axis of oscillation of said carrier to swing said carrier in opposite directions.

86. In a talking machine, the combination with a vertically movable turntable, of a record carrier movable over said turntable, and means for raising said turntable after said carrier has been moved into operative position over said turntable to lift a record from said carrier.

87. In a talking machine, the combination with a record turntable, of a record carrier, and means for moving said turntable axially to deposit a record upon said carrier.

88. In a talking machine, the combination with a record turntable, of a record carrier, and means for moving said turntable axially to remove a record from said carrier and to redeposit the same thereon.

89. In a talking machine, the combination with a rotary record support, of driving mechanism therefor, a plurality of record carriers, a support for said carriers movable

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with respect to said record support, means for adjusting the support of said carriers with respect to said record support, a brake for said driving mechanism, and means actuated by the release of said brake for locking the said carrier support in position.

90. In a talking machine, the combination of an arm pivoted to swing about a transverse axis, a sound box carried by said arm, driving mechanism for the talking machine, a locking piece for said arm and means actuated by said driving mechanism for throwing said locking piece into and out of action.

91. In a talking machine, the combination of a movable sound-conducting device, a sound-box suitably connected thereto, a device for driving the talking machine, a rod moved by this driving device, a second rod controlled by the first mentioned rod, a locking hook loosely mounted on the second rod and a locking arm secured to the sound-conducting device which locking arm is released by said locking hook at the beginning of the operation of the machine and is locked again on cessation of said operation.

92. In a talking machine, the combination of a movable sound-conducting device, a sound-box suitably connected therewith, a device for driving the talking machine, a rod moved by this driving device, a second rod controlled by the first mentioned rod, a yielding locking hook loosely mounted on the second rod, a locking arm which coacts with this locking hook and which is arranged on the sound-conducting device, and an arm rigidly connected to said second rod for throwing the locking arm of the sound-conducting device out of engagement with said locking hook during the motion of the second rod in one direction.

93. In a talking machine, the combination of a movable sound conducting device, a sound-box suitably connected therewith, a device for driving the talking machine, a rod moved from this driving device, a second rod controlled by the first mentioned rod, a locking hook loosely mounted on the second rod, a locking arm secured to the sound-conducting device and coacting with the said locking hook, which locking arm is released from said locking hook at the beginning of the operation of the machine and is locked again on the cessation of said operation, and a spring connected to said second rod, which spring is stressed by the motion of said rod in one direction and as it is unstressed affects the automatic return motion of the rod.

94. In a talking machine, the combination with a laterally movable sound conducting device, of a record support, of means to lock said sound conducting device, when said sound conducting device is swung laterally to one side of said support.

95. In a talking machine, the combination

with a laterally movable sound conducting device, of a record support, of means to lock said sound conducting device when said sound conducting device is swung laterally to one side of said support, and means to unlock said device at the beginning of the operation of said talking machine.

96. In a talking machine, the combination with a rotatable record support, of a record holder, means to remove a record from said holder and to place it upon said support, and means to start the rotation of said support before said record is deposited upon the same.

97. In a talking machine, the combination with a rotary record support, of a sound box mounted to swing across said support, driving mechanism for said support and means actuated by said driving mechanism for moving said sound box away from said support into an inverted position.

98. In a talking machine, the combination with a rotary record support, of a sound box mounted to swing across said support, driving mechanism for said support and means actuated by said driving mechanism for moving said sound box away from said support into an inverted position, and means actuated by said driving mechanism for returning said sound box toward said support.

99. In a talking machine the combination of a vertically movable supporting frame with a vertical shaft carried by said frame, carrier frames for removably supporting records pivoted in vertical series upon said shaft, a rotatable record support, means for driving said support and means for removing a record from its respective carrier frame to said rotatable support, said last-named means being operated by said driving means.

100. In a talking machine, the combination of a rotary support for talking machine records, with a magazine comprising a plurality of carriers for supporting records, and means actuated through a rack and pinion to shift a carrier and its respective record selectively from said magazine toward said support.

101. In a talking machine, the combination of a rotary support for talking machine records, with a magazine comprising a plurality of vertically disposed carriers for supporting records, and means automatically actuated to shift a carrier and its record selectively from said magazine toward said support.

102. In a talking machine, the combination of a rotary support for talking machine records, with a magazine comprising a plurality of vertically disposed carriers for supporting records arranged to swing about a single axis, and means automatically actuated to shift a carrier and its respective

record selectively from said magazine toward said support.

103. In a talking machine, the combination of a rotary support for talking machine records, with a magazine comprising a frame, a plurality of carriers carried by said frame for supporting records and arranged to swing about a single axis, and means automatically actuated to shift a carrier and its respective record selectively from said magazine toward said support.

104. In a talking machine, the combination of a rotary support for talking machine records, with a magazine for talking machine records, including a plurality of carriers for supporting records and arranged to be shifted vertically, and means automatically actuated to selectively shift a carrier and its record from said frame into alinement with said rotary support.

105. In a talking machine, the combination of a rotary support for talking machine records, with a magazine for talking machine records, a plurality of carriers for supporting records carried by said magazine, and means automatically actuated to selectively shift a carrier and its record from said frame into approximate alinement with said rotary support, and means to indicate the position of said magazine.

106. In a talking machine, the combination of a rotary support for talking machine records, with driving mechanism therefor, a magazine for talking machine records, means for manually shifting said magazine, a plurality of carriers for supporting the records carried by said magazine, and means automatically actuated by said mechanism to selectively shift a record from said magazine into substantial alinement with said rotary support.

107. In a talking machine, the combination of a rotary support for talking machine records, with driving mechanism therefor, a magazine for talking machine records, means for manually shifting said magazine, a plurality of carriers for supporting the records carried by said magazine, and means automatically actuated by said mechanism to selectively shift a record from said magazine into substantial alinement with said rotary support, and to shift said record back toward said magazine after being played.

108. In a talking machine the combination of a rotary support for talking machine records, with driving mechanism therefor, a magazine for talking machine records, means for manually shifting said magazine, a plurality of carriers for supporting the records carried by said magazine, and means automatically actuated by said mechanism to selectively shift a record from said magazine into substantial alinement with said rotary support and to shift

said record back to its original position in said magazine.

109. In a talking machine, the combination of a rotary support for talking machine records, with a magazine for talking machine records including a plurality of carriers for supporting disk records, and means automatically actuated to selectively shift one of said carriers and its respective disk record from said magazine into alinement with said rotary support.

110. In a talking machine, the combination of a rotary support for talking machine records, with a magazine for talking machine records, a plurality of carriers for supporting records carried by said magazine, and means automatically actuated to selectively shift a carrier and its record from said magazine into alinement with said rotary support, and to return the same to said magazine.

111. In a talking machine, the combination of a rotary support for talking machine records, with driving mechanism therefor, a magazine, a plurality of carriers for supporting disk talking machine records carried by said magazine, and means automatically actuated by said mechanism to selectively shift a disk record from said magazine into alinement with said rotary support, and to return the same to said magazine.

112. In a talking machine, the combination of a rotary support for talking machine records, with actuating means therefor, a magazine comprising a plurality of carriers for holding disk talking machine records, and means automatically actuated by said actuating mechanism for moving one of said carriers with its respective record selectively from said magazine toward said rotary support.

113. In a talking machine, the combination of a rotary support for talking machine records, with actuating means therefor, a magazine comprising a plurality of carriers for holding disk talking machine records, and means automatically actuated by said actuating mechanism for moving one of said carriers with its respective record from said magazine toward said rotary support.

114. In a talking machine, the combination of a rotary support for talking machine records with actuating means therefor, a magazine comprising a plurality of carriers for holding disk talking machine records, and means automatically actuated by said actuating mechanism for moving one of said carriers with its respective record selectively from said magazine toward said rotary support, and for returning the same to said magazine.

115. In a talking machine, the combination of a rotary support for talking machine records, with driving mechanism therefor,



a magazine for talking machine records, a plurality of carriers for supporting records carried by said magazine, and means automatically actuated by said mechanism to selectively shift a carrier and its record from said magazine into alinement with said rotary support, and for returning said carrier and record directly to their original positions in and with respect to said magazine.

116. In a talking machine the combination of a rotary support for talking machine records, driving mechanism therefor, a plurality of record carriers arranged to be shifted, and means to shift any one of said carriers selectively toward said support.

117. In a talking machine the combination of a rotary support for talking machine records, driving mechanism therefor, a plurality of record carriers arranged to be shifted, and means to shift any one of said carriers selectively toward said support, and to return said carrier to said magazine.

118. In a talking machine the combination of a rotary support for talking machine records, driving mechanism therefor, a plurality of record carriers arranged to be shifted, and means to shift any one of said carriers selectively toward said support, and to return said carrier to its original position in said magazine.

119. In a talking machine, the combination of a rotary support for talking machine records, driving mechanism therefor, a plurality of record carriers arranged to be shifted, and means actuated by said driving mechanism to shift any one of said carriers selectively toward said support.

120. In a talking machine, the combination of a rotary support for talking machine records, driving mechanism therefor, a plurality of record carriers arranged to be shifted, and means actuated by said driving mechanisms to shift any one of said carriers toward said support.

121. In a talking machine, the combination of a rotary support for talking machine records, driving mechanism therefor, a plurality of record carriers arranged to be shifted, and means actuated by said driving mechanism to shift any one of said carriers toward said support and to return said shifted carrier to its original position in said magazine.

122. In a talking machine, the combination of a rotary support for talking machine records, driving mechanism therefor, a plurality of record carriers arranged to be shifted, and means actuated by said driving mechanism to shift any one of said carriers toward said support and to return said shifted carrier to its original position in said magazine after its respective record has been played.

123. In a talking machine, the combination of a rotary support for talking machine

records, driving mechanism therefor, a plurality of record carriers arranged to be shifted, and means to shift any one of said carriers and its respective record selectively toward said support, to remove said record from said carrier to said support, to replace said record upon said carrier when said record has been played, and to return said carrier and record to their original places in said magazine.

124. In a talking machine, the combination of a rotary support for talking machine records, driving mechanism therefor, a plurality of record carriers arranged to be shifted, and means actuated by said driving mechanism to shift any one of said carriers and its respective record selectively toward said support, to remove said record from said carrier to said support, to place said record upon said carrier when said record has been played, and to return said carrier and record to their original places in said magazine.

125. A talking machine comprising a magazine for holding talking machine records, a rotary support for talking machine records, mechanism to actuate said support, means actuated by said mechanism to transfer a talking machine record from said magazine to said support and to return said record to said magazine when the reproduction thereof is completed, and means to stop said machine after said record has been returned to said magazine.

126. A talking machine comprising a magazine for holding talking machine records, a rotary support for talking machine records, mechanism to actuate said support, means actuated by said mechanism to transfer a talking machine record from said magazine to said support and to return said record to said magazine when the reproduction thereof is completed, and means actuated by said mechanism to stop said machine after said record has been returned to said magazine.

127. A talking machine comprising a magazine for holding talking machine records, a rotary support for talking machine records, mechanism to actuate said support, means actuated by said mechanism to selectively transfer a talking machine record from said mechanism to said support and to return said record to said magazine when the reproduction thereof is completed, and means to stop said machine after said record has been returned to said magazine.

128. A talking machine comprising a magazine for holding talking machine records, a rotary support for talking machine records, mechanism to actuate said support, means actuated by said mechanism to transfer a talking machine record from said magazine to said support and to return said record to its original position in said maga-

zine when the reproduction thereof is completed, and means to stop said machine after said record has been returned to said magazine.

5 129. A talking machine comprising a magazine for holding talking machine records, a rotary support for talking machine records, mechanism to actuate said support, means actuated by said mechanism to selectively transfer a talking machine record from said magazine to said support and to return said record to its original position in said magazine when the reproduction thereof is completed, and means actuated by said  
10 mechanism to stop said machine after said record has been returned to said magazine.

130. A talking machine comprising a magazine for talking machine records, a rotatable support for talking machine records, means for actuating said talking machine, means automatically operated by said actuating means to transfer a talking machine record from said magazine to said support and back to said magazine, and means to  
20 stop said machine after said record has been returned to said magazine.

131. A talking machine comprising a magazine for talking machine records, a rotatable support for talking machine records, means for actuating said talking machine, means automatically operated by said actuating means to transfer a talking machine record from said magazine to said support and back to its original position in said  
30 magazine, and means to stop said machine after said record has been returned to said magazine.

132. A talking machine comprising a magazine for talking machine records, a rotatable support for talking machine records, means for actuating said talking machine, selective means automatically operated by said actuating means to transfer a talking machine record from said magazine to said support and back to said magazine, and means to stop said machine after said record has been returned to said magazine.

133. A talking machine comprising a magazine for talking machine records, a rotatable support for talking machine records, means for actuating said talking machine, selective means automatically operated by said actuating means to transfer a talking machine record from said magazine to said support and back to its original position in said magazine, and means to stop said machine after said record has been returned to said magazine.

134. A talking machine comprising a

magazine for talking machine records, a rotatable support for talking machine records, means for actuating said machine, means automatically operated by said actuating means to transfer a talking machine record from said magazine to said support and back to said magazine, and means to automatically stop said machine after said record has been returned to said magazine.

135. A talking machine comprising a magazine for talking machine records, a rotatable support for talking machine records, means for actuating said machine, means automatically operated by said actuating means to transfer a talking machine record from said magazine to said support and back to its original position in said magazine, and means to automatically stop said machine after said record has been returned to said magazine.

136. A talking machine comprising a magazine for talking machine records, a rotatable support for talking machine records, means for actuating said machine, selective means automatically operated by said actuating means to transfer a talking machine record from said magazine to said support and back to said magazine, and means to automatically stop said machine after said record has been returned to said magazine.

137. A talking machine comprising a magazine for talking machine records, a rotatable support for talking machine records, means for actuating said machine, selective means automatically operated by said actuating means to transfer a talking machine record from said magazine to said support and back to its original position in said magazine, and means to automatically stop said machine after said record has been returned to said magazine.

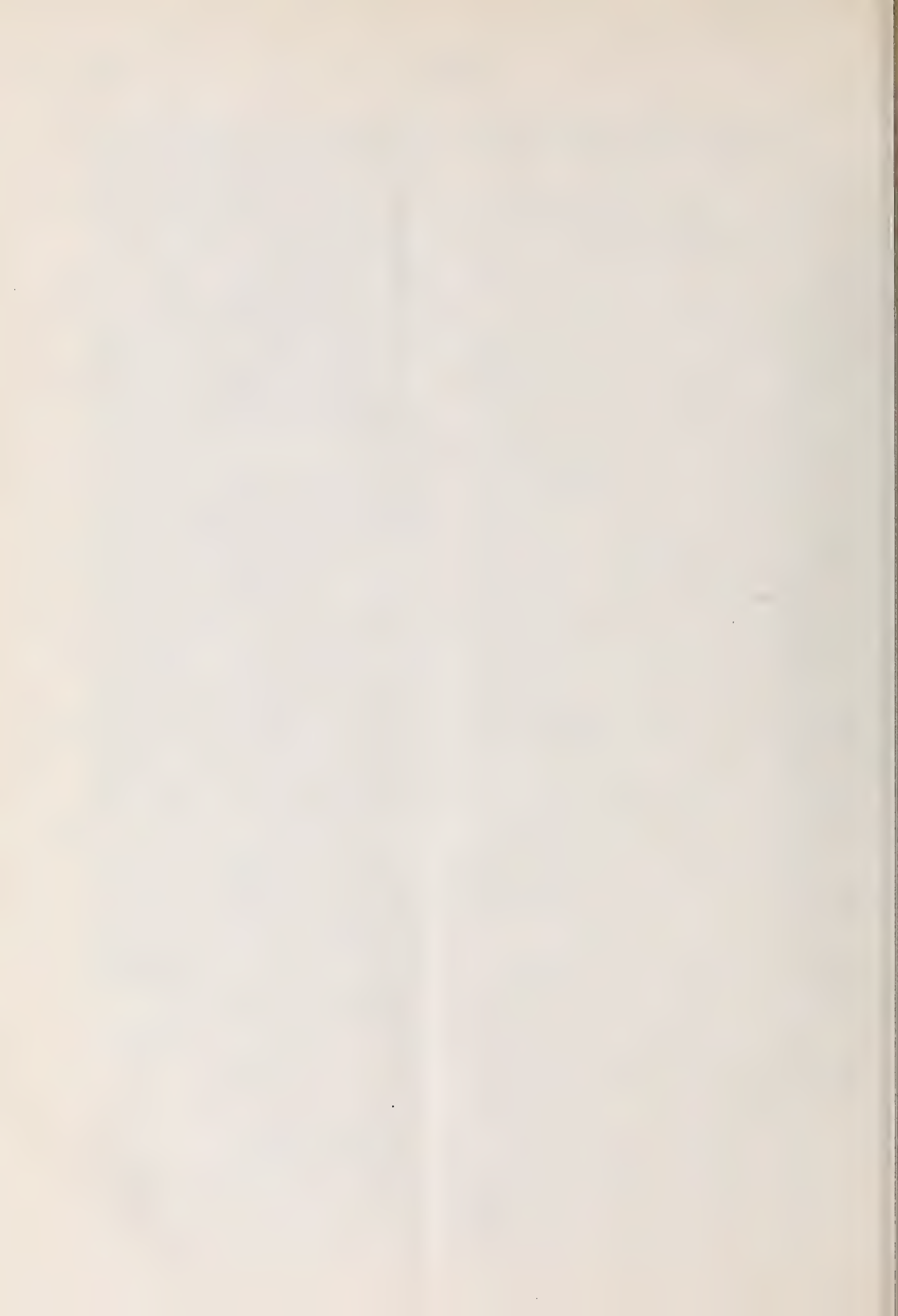
138. In a talking machine, the combination with a record support, of sound reproducing means movable into and out of operative position with respect to said support, means for holding said sound box in an inverted inoperative position, and stylus changing mechanism in operative position with respect to said sound reproducing means when said sound reproducing means is in said inverted position.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CLARENCE VOGT.

Witnesses:

LEWELLYN W. COLLINGS,  
CHARLES K. HADDON.





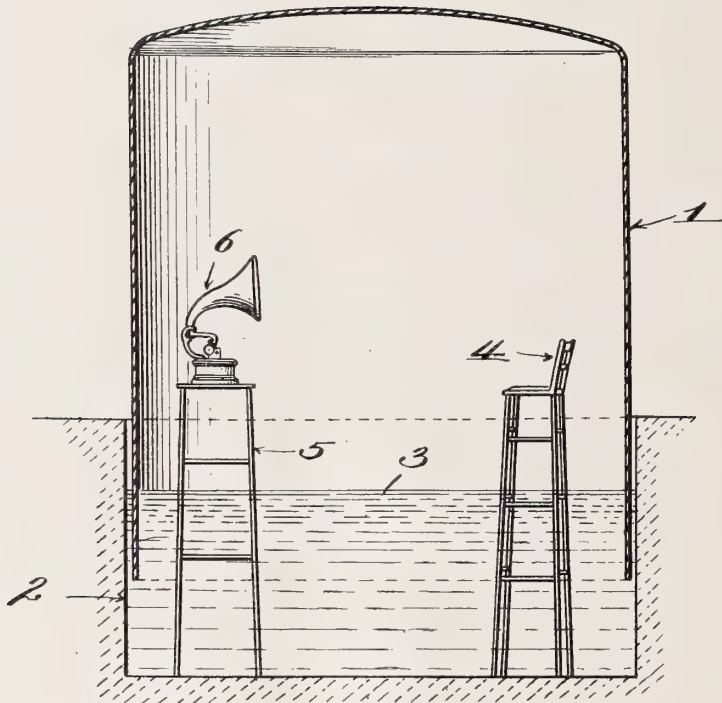




J. P. SNARE.  
METHOD OF PRODUCING TALKING MACHINE RECORDS.  
APPLICATION FILED MAR. 20, 1911.

1,035,057.

Patented Aug. 6, 1912.



Witnesses:  
*[Signature]*  
*[Signature]*

Inventor  
John P. Snare  
by *[Signature]*  
James L. Morris, Jr.  
Atty.

# UNITED STATES PATENT OFFICE.

JOHN P. SNARE, OF MODESTO, CALIFORNIA.

METHOD OF PRODUCING TALKING-MACHINE RECORDS.

1,035,057.

Specification of Letters Patent.

Patented Aug. 6, 1912.

Application filed March 20, 1911. Serial No. 615,624.

*To all whom it may concern:*

Be it known that I, JOHN P. SNARE, a citizen of the United States, residing at Modesto, in the county of Stanislaus and State of California, have invented new and useful Improvements in Methods of Producing Talking-Machine Records, of which the following is a specification.

The present invention has reference to the production of records for talking machines, and it comprehends, briefly, a method or process whereby the medium which transmits or carries the sound waves from the performer to the recording instrument is highly improved and rendered more efficacious for that purpose. To effect this object, the recording operation is carried out in a closed chamber wherein the contained air constituting the aforesaid transmitting medium is subjected to an appreciable degree of pressure, all extraneous disturbing influences which would otherwise affect such medium being at the same time removed, with the result that the voice of the performer is more perfectly reproduced than has heretofore been possible. This is due primarily to the fact that the condensation of the air produces a medium which transmits or carries the sound waves much more readily than air at normal or atmospheric pressure. In consequence, the slight strain to which the voice of the performer is subjected, (and this is particularly true of amateur recording, as opposed to professional recording in specially constructed and equipped laboratories), is avoided, and the sounds reproduced approach more nearly the natural tones actually sung or spoken. For the same reason, the lowest and softest tones may be perfectly recorded, and subsequently reproduced, and this holds good for both vocal and instrumental performances, which is a matter of considerable importance, inasmuch as at the present time many records of selections containing extremely low notes and pianissimo effects are more or less considerably spoiled by the flattening of a low note or the failure to record and reproduce all of the notes in a passage played or sung pianissimo. Finally, the recording is further facilitated to an appreciable extent both by constructing the chamber in part in the form of a bell made of sound-amplifying material, preferably metal, and in mounting such bell in much the same manner as the bell of a gas tank; that is to

say, the bell is supported in a pit or stand partly filled with water, which latter will act not only as a seal to prevent entrance of extraneous disturbing influences, but also, to some extent, as a deflector for directing the sound waves toward the recording instrument.

A vertical sectional view of one form of apparatus for carrying out the invention is illustrated in the accompanying drawing, but it is to be understood that such illustration is intended merely as diagrammatic, and, moreover, that the term "talking machine", as employed both above and hereinafter, is used in its broadest sense, as covering the so-called phonographs, graphophones, gramophones and the like in general use at the present time, without restriction to the character of record utilized in connection therewith.

The bell 1 shown in said drawing is, as has already been stated, preferably similar in the main to the ordinary gas bell, and is mounted for vertical movement in a tank, pit or other supporting receptacle 2, which is filled or partly filled with water, as indicated by the numeral 3. Upon the floor of said receptacle rest a chair 4 for the performer, and a stand 5 for the recording instrument 6, both the chair and stand being inclosed within the bell and being of sufficient height to project a considerable distance above the water level.

Any suitable means or devices may be employed for obtaining ingress to and egress from the bell; for instance, the bell may be raised to an extent sufficient to enable the performer to step from the top wall of the receptacle to the chair or it may be provided with a door through which the performer may enter, the door being so constructed as to fit tightly in its opening when closed, to prevent the entrance of air. In either instance, it will be apparent that the apparatus is closed after the performer is in place in his chair, thus producing a water sealed chamber due to the submergence of the lower end of the bell. Illustration of the means or devices for permitting such ingress and egress is, however, omitted, since the same form no part of the present invention.

The weight of the bell has the obvious effect of increasing the density of the air contained therein, and it is this condensed or compressed air which constitutes the im-

proved transmitting medium, the extent of condensation or compression being proportionate to the size and material of the bell, but under no circumstances reaching so high a point as to interfere with the comfort of the performer. The proper or necessary extent of such action may, in fact, be readily determined by experiments.

The actual recording operation is carried out in the usual manner, and, upon its conclusion, the recorded blank is removed from the machine and replaced by a fresh blank as is customary, the bell being raised or opened prior to the making of the new record if considered advisable.

It will be understood that the construction of the bell of material which will amplify the sound waves, preferably more or less resonant metal, tends to further improve the character of the record, and that a somewhat similar improvement is obtained by the employment of the water, owing to the latter's well known property of carrying or

transmitting sounds. Finally, the disposition of the recording instrument and the performer within a closed chamber of the type described precludes any extraneous influence from acting on, absorbing, or otherwise disturbing or injuriously affecting the transmission of the sound waves.

I claim as my invention:

The process of recording sound waves which consists in compressing a transmitting medium contained in a closure which surrounds the recording instrument and the source of sound, and transmitting the sound waves through the compressed medium to said instrument.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN P. SNARE.

Witnesses:

A. R. VOGELMAN,  
E. H. ZION.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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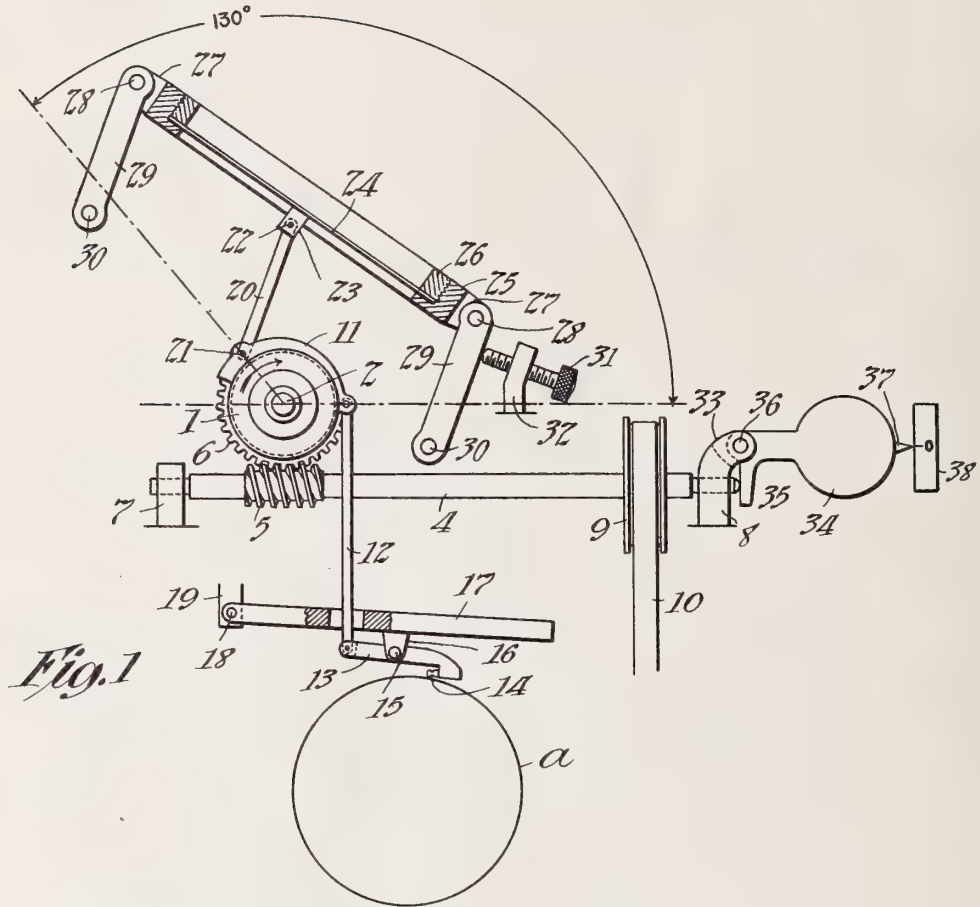




D. HIGHAM.  
 PHONIC APPARATUS.  
 APPLICATION FILED APR. 17, 1908.

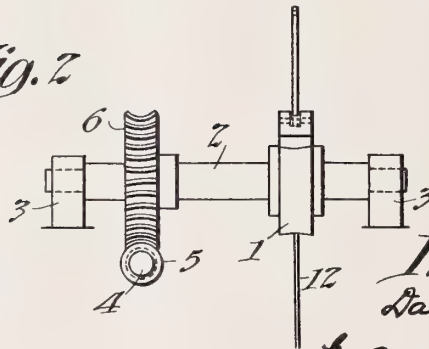
1,036,235.

Patented Aug. 20, 1912.



*Fig. 1*

*Fig. 2*



*Witnesses:*  
 Frank D. Currier  
 John W. Canfield

*Inventor:*  
 Daniel Higham  
 by Frank L. Spence  
 Atty.

# UNITED STATES PATENT OFFICE.

DANIEL HIGHAM, OF EAST ORANGE, NEW JERSEY.

## PHONIC APPARATUS.

1,036,235.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Application filed April 17, 1908. Serial No. 427,703.

*To all whom it may concern:*

Be it known that I, DANIEL HIGHAM, a citizen of the United States, and a resident of East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonic Apparatus, of which the following is a description.

My invention relates to phonic apparatus of the type in which a shoe is held in frictional engagement with the periphery of a rotating wheel of suitable material, such as amber, and the pressure of said shoe upon said wheel is varied by any suitable means which is representative of sound vibrations and which may be termed the primary vibrating means, as for example, a reproducer stylus capable of being operated by a phonograph sound record. Such variations in pressure cause corresponding variations in the friction between the wheel and shoe, thereby causing the shoe to vibrate in accordance with the sound vibrations and such movements of the said shoe may be transmitted by any suitable mechanical connection to a diaphragm or other means for propagating the effects of such variations in friction and which may be termed the secondary vibrating means. In this class of apparatus the friction shoe in frictional contact with the rotating friction wheel has a certain angular extension with respect to the periphery of the friction wheel and it is desirable that the angle of such extension should be considerable so that the shoe will have a tendency to "bite" or bind upon the friction wheel. The required amount of this circumferential extension or the degree of mechanical bite of the shoe must, in order to obtain the best results, vary inversely with the coefficient of friction of the frictional contact of the shoe and rotating wheel; that is, a lower coefficient of friction will require a greater circumferential extension or a stronger bite, and a higher coefficient will require correspondingly less extension or bite to obtain equal results from this type of apparatus. In such apparatus, however, the amount of circumferential extension of the friction shoe cannot be readily varied, although owing to varying atmospheric conditions which always affect the coefficient of friction, the latter continually varies so that it has heretofore been impossible to secure uniformly good results with this type of apparatus.

It is the object of this invention to provide means whereby variations in coefficient of friction can be readily compensated for, such means acting to vary or adjust the degree of the mechanical bite of the friction shoe upon the rotating friction wheel.

In order that my invention may be more fully understood, reference is hereby made to the accompanying drawing, of which—

Figure 1 is a side elevation, partly in section, of an apparatus constructed in accordance with my invention and adapted to be used as a phonograph reproducer, and Fig. 2 is a view of certain of the parts as viewed from the left in Fig. 1.

In the apparatus shown, the friction wheel 1, preferably of amber, is mounted on the horizontal shaft 2 which is journaled in suitable bearings 3 and driven in the direction of the arrow by a shaft 4 formed with a worm 5 which engages a worm gear 6 fixed to the shaft 2. The shaft 4 is journaled in bearings 7 and 8 and is provided with a pulley 9 over which passes a drive belt 10. The friction shoe 11 is applied to the periphery of the wheel 1, and there is a link 12 pivoted at one end to the shoe 11, and at the other end to a stylus lever 13 which carries a phonograph reproducer stylus 14 adapted to track the sound record groove of the record cylinder *a* which is rotated and advanced by usual means. The lever 13 is pivoted at 15 to a lug 16 depending from a weight 17 which is pivoted at 18 to a support 19. The weight 17 is similar to the ordinary floating weight of an Edison reproducer. There is a thrust link or coupling 20 pivoted at 21 to the shoe 11 and at 22 to a head 23 secured to the center of a diaphragm 24 of mica or other suitable material. The diaphragm 24 is seated within the frame 25 and secured in position by the clamping ring 26. The forward and rear edges of the frame 25 are provided with lugs 27 to which at 28 are pivoted the links 29. The lower ends of said links are pivoted at 30 to any suitable support, and the angular position of the links 29 with respect to their support and of the link 20 with respect to the shoe 11 and wheel 1, is determined and may be varied by an adjusting screw 31 which is threaded in the support 32. The bearing 8 has an extension 33 to which is pivoted at 36 a weight 34 having a depending arm 35 which bears against the end of the shaft 4. This weight carries an



index finger 37 which coöperates with a fixed scale 38 to indicate the rise and fall in the amount of thrust imparted to the shaft 4 in driving the friction wheel 1, the friction shoe 11 being pressed against the periphery of the friction wheel by the tension of the link 12 due to gravity of the weight 17. From the drawing it will be seen and understood that the link 20 will impart a mechanical bite tendency to the shoe 11 owing to its angular disposition in relation to the friction wheel 1. The varying or adjusting of this angle of link 20 which in turn varies or adjusts the mechanical bite tendency of the friction shoe, and thereby compensates for variations in the coefficient of friction of the frictional contact of the friction shoe with the rotating friction wheel is an important feature of my invention. It will be further seen from the drawing that link 20 and links 29 are parallel and of equal length and therefore, the angle of link 20 in relation to the friction wheel 1, can be readily adjusted without changing the position of the friction shoe on the friction wheel, for the adjusting screw 31 in swinging links 29 about the pivotal points of support 30 swings the link 20 about the point 21 on shoe 11 without changing the position of the friction shoe.

The structure illustrated represents the arrangement of an apparatus capable of producing good results. It is evident, however, that various changes may be made in the shapes and arrangements of the different parts, without departing from the spirit of my invention.

In practising my invention, the coefficient of friction of the frictional surfaces may be approximately .75, and the active portion of the angular extension of the frictional shoe around the friction wheel 130° (see Fig. 1). In case a lower coefficient of friction is used the angular extension of the shoe should be increased and in case a higher coefficient is used the angular extension should be decreased. When the apparatus is in proper adjustment the resistance of the wheel 1 to rotation will impart a sufficient thrust to the shaft 4 to move and sustain the weight 34 whereby the index finger 37 will designate the zero mark on the scale 38. When the amount of friction falls below that which is requisite the weight 34 will descend which indicates that the apparatus is out of adjustment owing to fall in the coefficient of friction and the adjusting screw 31 will then be turned so as to move inward, thereby increasing the bite of the shoe on the friction wheel and compensating for the fall in the coefficient of friction and which compensation will be indicated by the rising of the weight 34 to the proper position. On the other hand if the weight 34 is seen to be above its proper working position this indi-

cates that the apparatus is out of adjustment owing to excessive friction or bite of the shoe upon the wheel and is corrected by turning the adjusting screw 31 so as to cause the link 20 to move toward a line tangent to the friction wheel. The amount of friction developed depends both upon the angular extent of the friction shoe around the wheel 1 and upon the angle of the link 20, so that it is possible by using a somewhat different angle of said link to use a shoe of more or less than 130° with the same coefficient of friction and with the same tension on the link 12, but I prefer the arrangement shown and described.

The weight 17 should be of proper size for causing the stylus 14 to properly track the sound record groove of the cylinder *a*, as in an Edison phonograph reproducer, and the total thrust upon the shaft 4 due to the resistance of the friction wheel may be approximately seven times the tension on the link 12 when the relative diameters of the friction wheel 1 and gear 6 are as shown. If the diameter of the wheel 1 is increased or that of the gear 6 decreased the thrust upon the shaft 4 will be correspondingly increased and vice versa when the diameter of the wheel 1 is decreased or that of the gear 6 increased.

Having now described my invention, what I claim is:

1. In an apparatus of the character described, the combination of a rotating friction wheel, a shoe engaging the same, a floating weight, a stylus lever pivoted to said weight, a connection between said weight and said shoe through which the said weight acts upon said shoe to press the same against the friction wheel, a thrust member secured to said shoe and pressing the same against the wheel when the latter is rotating, and means for varying the pressure so exerted, substantially as set forth.

2. In an apparatus of the character described, the combination of a rotating friction wheel, a shoe in engagement with the upper surface thereof, a diaphragm connected to said shoe, a floating weight and a stylus lever and stylus carried thereby and connected to said shoe whereby the floating weight tends to press the shoe down upon the friction wheel, substantially as set forth.

3. In an apparatus of the character described, the combination of a rotating friction wheel, a shoe in engagement with the upper surface thereof, secondary vibrating means connected to said shoe, a floating weight and a lever pivoted to said weight and connected to said shoe whereby the floating weight tends to press the shoe down upon the friction wheel, substantially as set forth.

4. In an apparatus of the character described, the combination of a rotating fric-

tion wheel, a shoe in engagement therewith, secondary vibrating means, means for coupling said secondary vibrating means to said shoe and means for varying the angle of said coupling with respect to said friction wheel to vary the bite of said shoe on said wheel, substantially as set forth.

5 In an apparatus of the character described, the combination of a rotating friction wheel, a shoe in engagement therewith, a diaphragm, a coupling connected to said diaphragm and pivoted to said shoe, and means for adjusting the position of said diaphragm to vary the angle of said coupling with respect to said friction wheel to vary the bite of said shoe on said wheel, substantially as set forth.

6 In an apparatus of the character described, the combination of a rotating friction wheel, a shoe in engagement therewith, secondary vibrating means connected to said shoe and an adjustable support therefor for varying the angle of the connection of the secondary vibrating means with said shoe to vary the bite of said shoe on said wheel, substantially as set forth.

7 In an apparatus of the character described, the combination of a rotating friction wheel, a shoe in engagement therewith, secondary vibrating means, a link pivotally connected to said shoe and said secondary vibrating means, and a support for the latter adjustable to move to different positions to vary the angular position of said link to vary the bite of said shoe on said wheel, and means for holding said support in a desired position, substantially as set forth.

8 In an apparatus of the character described, the combination of a rotating friction wheel, a shoe in engagement therewith, secondary vibrating means, a link pivotally connected to said shoe and said secondary vibrating means, and a support for the latter comprising pivotal links approximately parallel and equal in length to said connecting link, substantially as set forth.

9 In an apparatus of the character described, the combination of a rotating friction wheel, a shoe in engagement therewith, means for varying the friction between said shoe and wheel in accordance with sound vibrations, means for rotating said wheel and means for indicating under all conditions of operation the resistance of said wheel against rotation, substantially as set forth.

10 In an apparatus of the character described, the combination of a rotating friction wheel, a shoe in engagement therewith, a shaft, means supporting said shaft to allow some axial movement thereof, a worm gear on said shaft, a worm meshing with

said worm gear, means for rotating said worm, means for varying the friction between said shoe and wheel in accordance with sound vibrations and means for indicating the thrust imparted to said worm by the resistance against rotation of the friction wheel, substantially as set forth.

11 In an apparatus of the character described, the combination of a rotating friction wheel, a shoe in engagement therewith, means for rotating said wheel, primary vibrating means adapted to vibrate in accordance with sound vibrations, secondary vibrating means, connections between each of the said vibrating means and said shoe, and means for indicating under all conditions of operation the resistance of said wheel against rotation, substantially as set forth.

12 In an apparatus of the character described, the combination of a rotatable friction wheel, a shoe in engagement therewith, means for varying the friction between said shoe and wheel in accordance with sound vibrations, means for rotating said wheel including a shaft mounted to allow some axial movement thereof and so positioned as to be given a thrust by the resistance against rotation of the friction wheel, and means for measuring the thrust thus imparted substantially as set forth.

13 In an apparatus of the character described, the combination of a rotatable friction wheel, a shoe in engagement therewith, means for varying the friction between said shoe and wheel in accordance with sound vibrations, means for rotating said wheel including a shaft mounted to allow some axial movement thereof and so positioned as to be given a thrust by the resistance against rotation of the friction wheel, means resisting the axial movement of said shaft due to such thrust, and means for indicating the amount of such resistance, substantially as set forth.

14 In an apparatus of the character described, the combination of a rotatable friction wheel, a shoe in engagement therewith, means tending to press said shoe against said wheel, means for varying the pressure of said shoe upon said wheel in accordance with sound vibrations, and means for indicating under all conditions of operation the resistance of said wheel against rotation, substantially as set forth.

This specification signed and witnessed this 15th day of April 1908.

DANIEL HIGHAM.

Witnesses:

H. H. DYKE.

FRANK D. LEWIS.





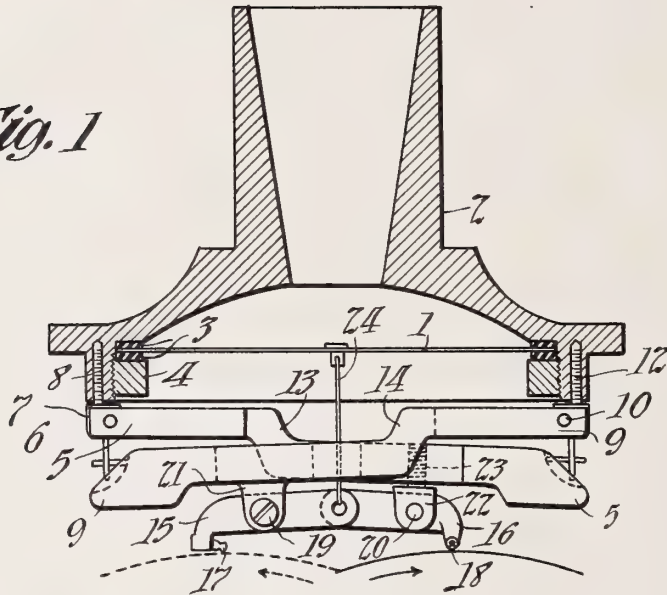


F. D. LEWIS.  
 PHONOGRAPH.  
 APPLICATION FILED APR. 12, 1909.

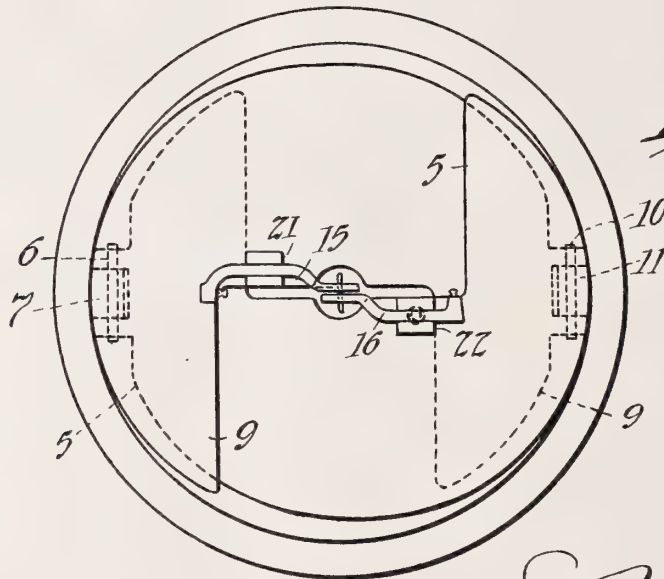
1,036,279.

Patented Aug. 20, 1912.

*Fig. 1*



*Fig. 2*



*Witnesses:*  
 Dyer Smith  
 Delos Holden

*Inventor:*  
 Frank A. Lewis  
 by Frank L. Avery  
 Atty.

# UNITED STATES PATENT OFFICE.

FRANK D. LEWIS, OF ELIZABETH, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH.

1,036,279.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Application filed April 12, 1909. Serial No. 489,411.

*To all whom it may concern:*

Be it known that I, FRANK D. LEWIS, a citizen of the United States, and a resident of Elizabeth, in the county of Union and State of New Jersey, have made a certain new and useful Invention in Phonographs, of which the following is a description.

My invention relates particularly to phonograph reproducers, and my object is chiefly to provide a device by means of which two styluses adapted to track records of different character as the well known "one hundred thread" and "two hundred thread" records, may be carried by the single reproducer, which is provided with a single diaphragm, one of the said styluses being in operative position to track the record with which it is designed to cooperate, while the other stylus is in inoperative position. I prefer to remove one stylus from operative position and place the other stylus in such position by a bodily movement of the whole reproducer, preferably by swinging the same through an angle of 180 degrees.

In carrying out my invention, the two styluses referred to are mounted on stylus levers which are preferably pivotally mounted each on a separate floating weight. The construction of these two floating weights, by means of which the weight of each may be advantageously distributed and the construction made compact and efficient, also forms the subject matter of one of the objects of my invention.

Another object is the provision of improved means for pivoting the stylus levers in their respective floating weights, whereby universal motion of the stylus may be attained.

Other objects of my invention reside in the details of construction and combinations of elements, as will be hereinafter described and claimed.

Attention is hereby directed to the accompanying drawings forming part of this specification, and in which the same characters are used to denote corresponding parts.

In the drawings, Figure 1 represents a central vertical section through my improved reproducer, some of the elements being shown in side elevation. Fig. 2 is a bottom plan view of the same.

Referring to the drawings, the diaphragm 1 is secured in the sound box 2 by means of

gaskets 3 and adjusting ring 4, as is common. The floating weight 5 is pivotally secured by pin 6 to block 7, which is pivotally secured to the body of sound box 2 by threaded pin 8, as is also common. Diametrically opposite to the pivotal mounting of floating weight 5, as has been described, the floating weight 9 is similarly mounted, being pivoted by pin 10 to block 11, which is pivoted by threaded pin 12 to the body of the sound box. As shown in the plan view in Fig. 2, the floating weight 5 extends over substantially the whole area of a circle except for a central upper portion of the same, so that if the drawing be held with the pivotal mounting of the floating weight shown in Fig. 2, at the top, the weight will be roughly the shape of a very thick letter C. Similarly, the floating weight 9 covers substantially the whole area of a circle with the exception of a central lower portion, so that if Fig. 2 be held with the pivotal mounting of weight 9 above, the said weight 9 will be seen to also have approximately the shape of a thick letter C.

By the conformation of the weights just described it is possible to mount the same compactly, the pivotal mounting of one weight being above the tail of the other. The part of each weight which extends above the tail of the other, as described, extends substantially parallel to the diaphragm, until the part of the weight which has been removed is reached, when a sharp downward bend occurs, such as shown at 13 in the case of weight 5 and 14 in the case of weight 9. At these downwardly bent portions the two weights pass each other, each extending through the space provided for its passage in the other. Thus, the weight 9 extends to the left from its pivotal mounting above the tail of the weight 5 until it descends at bend 14 from which point it extends to its tail below the pivotal mounting of weight 5, while weight 5 extends to the right from its pivotal mounting above the tail of weight 9 until the downward bend 13 is reached, after which point the weight 5 extends to its tail below the pivotal mounting of weight 9. By this method of mounting the weights, the proper concentration of weight above the corresponding styluses is attained without undue thickening of the weight, the tail of each weight thus constituting a leverage extension.



Stylus lever 15 is carried by floating weight 9 and stylus lever 16 is carried by floating weight 5 in any convenient manner. Stylus 17 is secured to lever 15 and stylus 18 is carried by lever 16, stylus 17, as shown, being adapted to cooperate with the 100 thread records and stylus 18 with the 200 thread records, although, of course, it is obvious that my invention is not confined to records of the particular character described. Lever 15 is pivoted to horizontal pin 19 and lever 16 to horizontal pin 20, pin 19 being mounted in lugs 21 and pin 20 in lugs 22.

Lugs 21 and 22 may be cast integral with the bottoms of their respective floating weights if desired, but I prefer to mount them as shown in order to permit free movement of the respective styluses transverse to the record groove with which they are adapted to cooperate. Thus, the lugs 22 carrying stud 20 have formed integral therewith the threaded pin 23, which is adapted to be screwed into a threaded hole in floating weight 5. Lugs 21 carrying pin 19 on which lever 15 is mounted may have formed integral therewith a corresponding threaded pin, which is screwed into a threaded hole in floating weight 9. These screws are adjusted to properly position the styluses and afford pivotal movement of the stylus levers and the styluses carried thereby in a direction transverse to the record groove. In yielding to whatever irregularity or curve of the record causes movement of the stylus transverse to the groove, the threaded pin as 23 will tend to screw itself slightly up or down in the floating weight in which it is mounted, but the transverse movements will be so slight that the vertical movement thus given the lever mounting will be inconsiderable. It is, however, obvious that I am not limited to the style of pivotal mounting shown, but that any other means by which the stylus may be allowed movement transverse to the record groove may be used, as for example, the pivotal mounting described in the application of Peter Weber, Serial No. 456,701, filed October 8, 1908, or that described in the application of Dyer and Weber, Serial No. 484,811, filed March 20, 1909, or any other convenient pivotal mounting. The stylus levers 15 and 16 which are mounted as described are preferably bent so that styluses 17 and 18 are brought into the same diametrical line through the axis of the reproducer, which line is preferably the diameter of the reproducer bisecting the pivotal mountings of the two weights. The tails of the two levers 15 and 16 are brought adjacent to each other and are connected by the single link 24 to the center of diaphragm 1. In operation, when stylus 18 is engaging the record surface as shown in the drawings, stylus 17 is in-

operative and out of engagement. When it is desired to bring stylus 17 into engagement with the record surface and place stylus 18 in inoperative position, reproducer 2 is lifted out of position and turned through an angle of 180 degrees, whereupon the two styluses will have interchanged places.

It is obvious that I am not confined to the exact details of construction, but that my invention is as broad as the wording of the appended claims.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. In a phonograph reproducer, the combination with a sound box and a diaphragm mounted therein, of a pair of interfitting floating weights carried by said sound box, a stylus lever carried by each floating weight, a stylus carried by each lever and means for connecting said levers to the center of said diaphragm.

2. In a phonograph reproducer, the combination with a sound box and a diaphragm mounted therein, of a pair of interfitting floating weights pivoted to said sound box at diametrically opposite points thereof, a stylus lever carried by each floating weight, a stylus carried by each lever, and means for connecting said levers to the center of said diaphragm, substantially as described.

3. In a phonograph reproducer, the combination with a sound box and a diaphragm mounted therein, of a pair of interfitting floating weights carried by said sound box, a stylus lever carried by each floating weight, a stylus carried by each lever, and means for connecting said levers to the center of said diaphragm, each of said weights having a part located directly above and a part located directly below the other weight, substantially as described.

4. In a phonograph reproducer, the combination with a sound box and a diaphragm mounted therein, of a pair of interfitting floating weights carried by said sound box, a stylus lever carried by each floating weight, a stylus carried by each lever, and means for connecting said levers to the center of said diaphragm, said styluses being located in a straight line intersecting the axis of the reproducer, substantially as described.

5. In a phonograph reproducer, the combination with a sound box and a diaphragm mounted therein, of a pair of interfitting floating weights carried by said sound box, a lever for each weight, means permitting transverse oscillation of said levers for pivotally mounting the latter on said weights, and means for connecting said levers to the center of said diaphragm, substantially as described.

6. In a phonograph reproducer, the combination with a sound box and a diaphragm,

of a pair of interfitting floating weights, means for pivotally mounting the said weights to the sound box at diametrically opposite points thereof, a stylus lever carried by each weight, a stylus carried by each lever, and means for connecting the tails of the said levers to the diaphragm, each weight extending partly above and partly below the other, substantially as described.

10 7. In a phonograph reproducer, the combination with a sound box and a diaphragm, of a pair of interfitting floating weights, means for pivotally mounting the said weights to the sound box at diametrically

opposite points thereof, a stylus lever carried by each weight, a stylus carried by each lever, and means for connecting said levers to the diaphragm, each weight being formed with a leverage extension beyond the fulcrum of the stylus lever carried by such weight, substantially as described.

This specification signed and witnessed this 9th day of April 1909

FRANK D. LEWIS.

Witnesses:

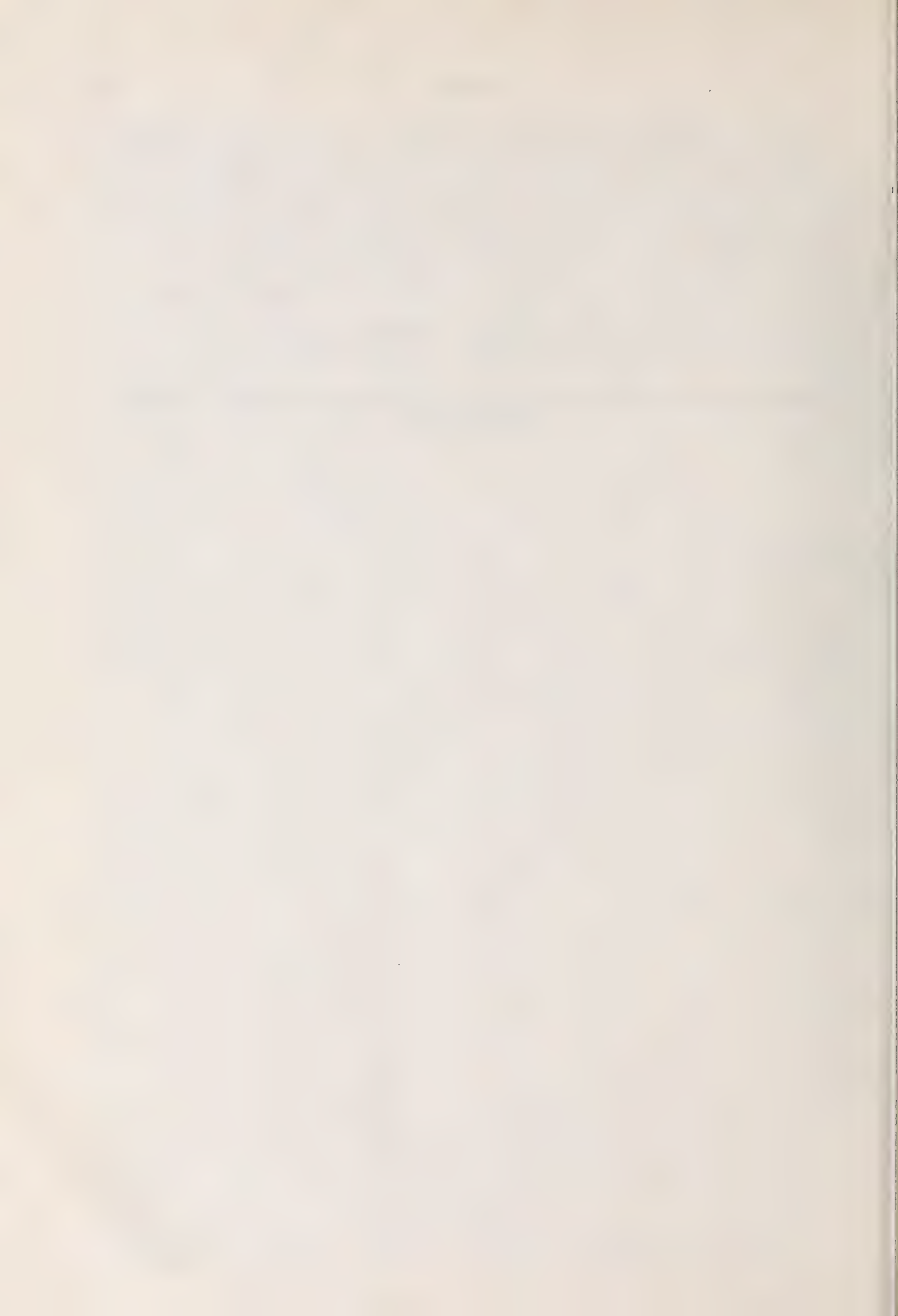
DYER SMITH,

JOHN M. CANFIELD.

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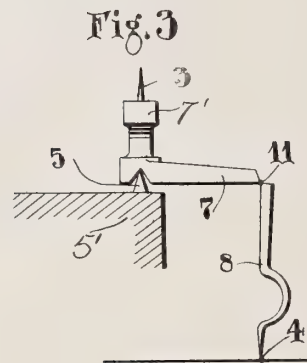
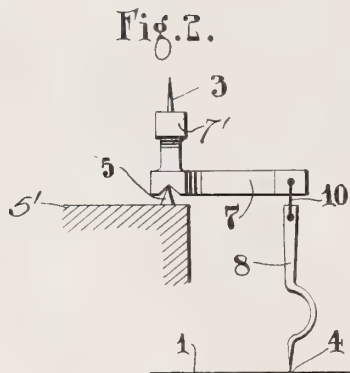
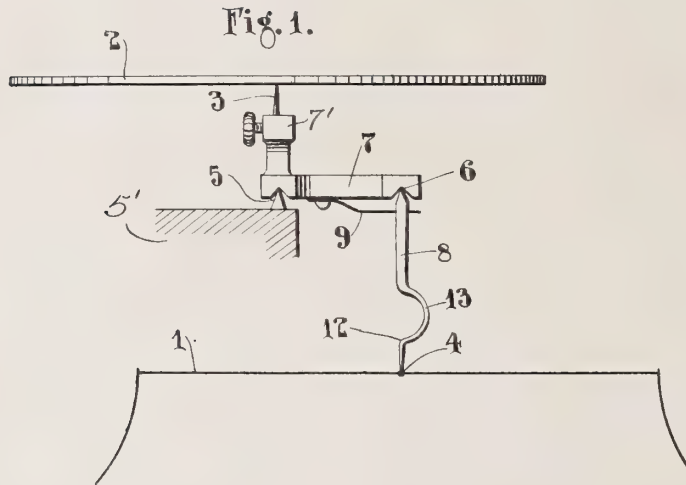




L. LUMIERE.  
TALKING MACHINE.  
APPLICATION FILED NOV. 19, 1909.

1,036,285.

Patented Aug. 20, 1912.



Witnesses:  
F. J. Hartman.  
Alton B. Moulton

Inventor:  
Louis Lumiere.  
By Harvey  
Attorney.

# UNITED STATES PATENT OFFICE.

LOUIS LUMIERE, OF LYON, FRANCE.

TALKING-MACHINE.

1,036,285.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Application filed November 19, 1909. Serial No. 528,881.

*To all whom it may concern:*

Be it known that I, LOUIS LUMIERE, a citizen of the French Republic, and residing at 262 Cours Gambetta, Lyon, France, have invented certain new and useful Improvements in and Relating to Talking-Machines, of which the following is a specification.

This specification relates to improvements in talking machines, particularly to that type of talking machine illustrated in and forming the subject-matter of my Letters Patent of the United States, No. 986,477, dated March 14, 1911, special reference being had to the construction illustrated in Figure 10 of said application.

My invention has for its object, to provide improved means for connecting the stylus with the diaphragm.

A further object of this invention is to so construct the connection between the stylus and the diaphragm, particularly when diaphragms of large diameter are employed, such as are illustrated in my above mentioned application, that the said diaphragms are permitted to and will vibrate freely and fully without being subjected to any torsional or other strains, due to the fact that the diaphragm is attached to a stylus bar, the axis of oscillation of which is comparatively remote from the diaphragm; and to so arrange the connection that the point of the attachment of the stylus with the diaphragm will not vibrate in any other manner than in a line substantially normal to the plane of the diaphragm.

In carrying out my invention, I make the connection between the stylus and the diaphragm in such a manner that the diaphragm is located substantially parallel with a disk record, and I provide such a connection between the diaphragm and the point of the stylus that by simply turning the sound box through a right angle in the plane of the diaphragm, the sound box may be used with both of the common types of disk records; that is to say, with disk records in which the sound waves are recorded in the form of a groove, the bottom of which is provided with vertically arranged undulations corresponding to sound waves, or with disk records in which the sound is recorded as a sinuous line or as a groove of substantially uniform depth, but provided with lateral undulations in the side walls thereof. When the diaphragm of the sound box is parallel to the disk

record, it will cooperate, for instance, with a record such as is above described, having the sound recorded in a groove having lateral undulations, and when the sound box is turned through an angle of 90 degrees it will be adapted to cooperate, with a record in which the sound is recorded as a groove having vertical undulations. This operation or manipulation of the sound box to cooperate with these different types of sound records is provided for and accomplished by means of the connection between the stylus and the diaphragm, illustrated in the drawings of this application, and the construction consists of a bell crank lever, one arm of which is provided with means whereby the stylus may be attached thereto, and the other arm of which is connected by a direct connecting bar with the diaphragm, the said connecting bar being arranged normally to the plane of the diaphragm, and attached to the arm of the bell crank lever by means of a flexible or yielding connection. From the above it will be seen that the disk record is substantially in a plane parallel with the diaphragm and with one arm of the bell crank lever, while the axis of the other arm of the bell crank lever and the connecting bar between the bell crank lever and the diaphragm is substantially parallel. In order that the rigid bell crank lever may not exert a tension upon the diaphragm in any other direction than in a line normal to the plane of the diaphragm, the bell crank lever and the said connecting bar are yieldably attached to each other by means of any suitable elastic joint.

Further objects of my invention will appear in the specification and claims below.

Referring now to the drawing forming a part of this application, Fig. 1 is a partial side elevation of one construction embodying my invention; and Figs. 2 and 3 are similar views of modified forms of my invention. In all these figures the manner of mounting the diaphragm and the manner of mounting the stylus bar, in so far as the support for these parts is concerned, are not illustrated, inasmuch as they are substantially the same as is illustrated in the drawings of my aforesaid Patent No. 986,477.

Referring to Fig. 1, the diaphragm 1 is arranged substantially parallel to the disk record 2, upon which sounds are to be recorded or from which sounds are to be reproduced. My invention relates to the con-



struction of the stylus bar between the stylus 3 and the point of attachment 4 of the same with the diaphragm. This stylus bar is mounted in any suitable manner, as upon  
 5 knife edges 5, carried by a suitable support 5', which support may be connected in any suitable manner with the casing upon or within which the diaphragm 1 is mounted. The stylus bar proper consists of a bell  
 10 crank lever 7, one arm of which is provided with a socket 7', within which is secured the stylus 3, and the other arm of which engages and is connected to the connecting bar 8, which extends at right angles to the arm  
 15 of the bell crank lever with which it is in engagement, and has its opposite end secured to the diaphragm 1 at the point 4. In this embodiment of my invention, the arm of the bell crank lever which is connected  
 20 with the connecting bar 8 is provided with a recess or V-shaped groove 6, and the adjacent end of the connecting bar 8 is provided with a knife edge resting therein. This provides a flexible or a yielding con-  
 25 nection between the stylus bar 7 and the connecting bar 8. In order that the stylus bar 7 and the connecting bar 8 may be in actual operative engagement at all times, the leaf spring 9 is provided, attached in  
 30 any suitable manner at one end to the bell crank lever 7 and having its other end secured to said connecting bar 8. It is sometimes desirable to make the connecting bar slightly yielding in the direction of its  
 35 length, and for that purpose a bend 13 may be provided in order to give the bar a slight elasticity.

With such a construction as I have above described, it will be clear that if the disk  
 40 record 2 be provided with a record groove in which the sound is recorded as vertical undulations in the bottom thereof, the stylus 3 will be vibrated in following the undulations in said groove, and will cause the outer  
 45 end of the bell crank lever 7 to vibrate in the same manner. The vibration of the bell crank lever is communicated to the diaphragm 1 through the connecting bar 8, and on account of the yielding connection be-  
 50 tween the bell crank lever and the connecting bar, the vibrations will be transmitted to the diaphragm substantially in a line normal to the surface of the diaphragm. It will also be apparent that if the disk record  
 55 2 be provided with grooves in which the sound is recorded in the side lines of the groove as lateral undulations, the stylus 3 will be vibrated thereby if the sound box and the stylus bar and diaphragm carried  
 60 thereby be merely turned through an angle of ninety degrees in the plane of the diaphragm, and in cooperating with such a record the stylus will be vibrated similarly to the manner in which it was vibrated with  
 65 the other type of record, and the vibrations

of the stylus will be transmitted to the diaphragm in the same manner. The flexible connection between the stylus bar or bell crank lever 7 and the connecting bar 8 avoids all tendency of the stylus bar to im-  
 70 press upon the diaphragm strains or tensions in any other direction than in a line normal to the plane of the diaphragm, no matter how long the arm of the stylus bar or bell crank lever may be, or how remote  
 75 it may be from the axis upon which it vibrates. This construction is therefore particularly adapted for use in connection with diaphragms of large diameter. The leaf  
 80 spring 9, which holds the connecting bar and the bell crank lever together, prevents any lost motion or rattle between the said parts. It prevents, in fact, all motion except a slight angular motion at the knife  
 85 edge joint.

In Fig. 2, the flexible joint between the bell crank lever and the connecting bar is formed by a leaf spring 10, the ends of which are secured to the bell crank lever 7 and the rod or bar 8, respectively, and in  
 90 Fig. 3 is illustrated another kind of flexible connection between the said parts, the same being formed by reducing the thickness of the parts 7 and 8 at the point where they engage each other, so that the reduced  
 95 portion forms a spring. If desirable, similar joints may be arranged at the point 12. It will be plain, however, that whether the arm 7 of the stylus bar and the connecting bar or rod 8 between the stylus bar and the  
 100 diaphragm be made, as illustrated in Figs. 1 and 2, of separate pieces unitarily held in operative relation, or be made integral and connected together by a reduced portion 11,  
 105 as shown in Fig. 3, the connection between the said parts is a pivotal connection and comprises a yielding connecting means to permit of a free, angular, relative movement between the stylus bar and the connect-  
 110 ing bar.

While other forms of pivotal connections might be used without departing from the spirit and scope of this invention, the forms illustrated in the drawings and described  
 115 in the specification above, constitute the preferred embodiments of my invention. It is to be further observed that in all these forms above referred to, the means for attaching or connecting the stylus bar with the connecting rod is independent of the  
 120 support upon which the stylus bar is mounted to oscillate.

Having thus described my invention, what I claim and desire to protect by Letters  
 125 Patent of the United States, is:

1. In a sound box, the combination with a support, of a rigid stylus bar mounted to oscillate on said support, a diaphragm, a flexible connecting bar independent of said support and secured at one end to said dia-  
 130

phragm, the other end of said connecting bar being rigid and abutting against said stylus bar, and yielding means independent of said support to hold said connecting bar 5 and said stylus bar in operative engagement with each other.

2. In a sound box, the combination with a support, of a rigid stylus bar mounted to oscillate on said support, a diaphragm, 10 a flexible connecting bar independent of said support and secured at one end to said diaphragm, an anti-friction bearing between the opposite end of said connecting bar and said stylus bar, and yielding means 15 mounted independent of said support to hold said connecting bar and said stylus bar in operative engagement with each other.

3. In a sound box, the combination with a support, of a rigid stylus bar mounted to oscillate on said support, a diaphragm, a 20 flexible connecting bar independent of said support secured at one end to said diaphragm, a knife edge bearing between the opposite end of said connecting bar and said stylus bar, and yielding means independent 25 of said support to hold said connecting bar and said stylus bar in operative engagement with each other.

4. In a sound box, the combination with a support, a rigid stylus bar mounted to oscillate on said support, a diaphragm, a 30 connecting bar independent of said support secured at one end to said diaphragm, a knife edge bearing between the opposite end of said connecting bar and said stylus bar, and yielding means independent of 35 said support to hold said connecting bar and said stylus bar in operative engagement with each other, said connecting bar being provided with a flexible and with a rigid 40 portion.

5. In a sound box, the combination with a support, of a rigid stylus bar mounted to oscillate on said support, a diaphragm carried by said support, a connecting bar hav- 45 ing a substantially rigid end and having a longitudinally curved flexible portion, the rigid end of said connecting bar engaging said stylus bar in a knife edge bearing, and 50 the other end of said connecting bar being connected to said diaphragm, and yielding means independent of said support holding said connecting bar and said stylus bar in operative engagement with each other.

6. In a sound box, the combination with a support, of a rigid stylus bar in the form of a bell crank lever mounted to oscillate on said support, a diaphragm carried by said support, a connecting bar having a sub- 60 stantially rigid end and having a longitudinally curved flexible portion, the rigid end of said connecting bar engaging said stylus bar in a knife edge bearing, and the other end of said connecting bar being connected to said diaphragm, and yielding means in- 65 dependent of said support holding said connecting bar and said stylus bar in operative engagement with each other.

7. In a sound box the combination with a support, of a rigid stylus bar mounted to oscillate on said support, a diaphragm, and a connecting bar secured to said diaphragm, said connecting bar being provided with a rigid and with a flexible portion, said rigid 70 and flexible portions being integral with each other and said rigid portion being held in pivotal engagement with said stylus bar. 75

8. In a sound box, the combination with a support, of a rigid stylus bar mounted to oscillate on said support, a diaphragm, and 80 a connecting bar secured to said diaphragm, said connecting bar being provided with a rigid and with a flexible portion, said rigid and flexible portions being integral with each other and in pivotal engagement with 85 said stylus bar.

9. In a sound box, the combination with a support, of a diaphragm, means for holding a stylus, including a comparatively rigid part mounted to oscillate on said support, 90 and a connecting part between said first-mentioned part and said diaphragm, said connecting part being provided with a flexible and with a rigid portion, and the oscil- 95 lation of said first-mentioned part resulting in the longitudinal reciprocation of said connecting part, and yielding means between said comparatively rigid part and said connecting part, and connected only to 100 said parts.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LOUIS LUMIERE.

Witnesses:

GASTON JEANNIAUX,  
THOMAS N. BROWNE.





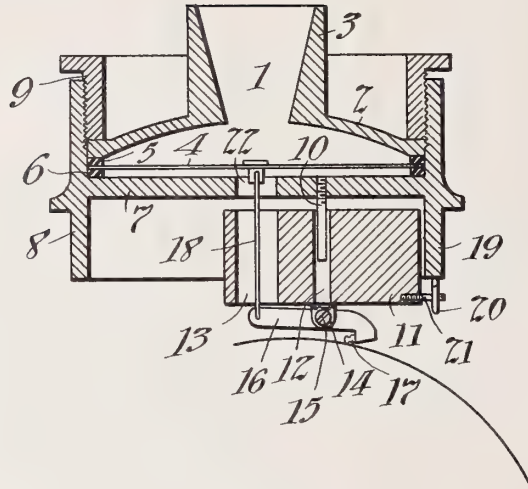


A. N. PIERMAN.  
 PHONOGRAPH REPRODUCER.  
 APPLICATION FILED NOV. 19, 1908.

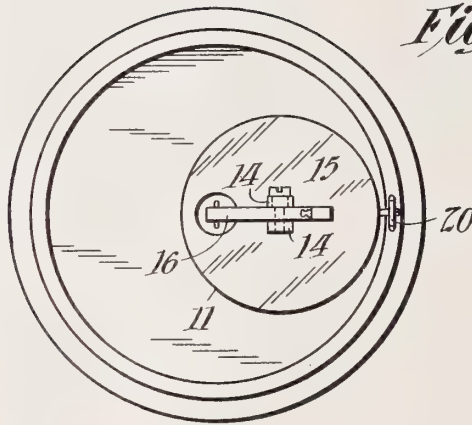
1,036,329.

Patented Aug. 20, 1912.

*Fig. 1*



*Fig. 2*



*Witnesses:*  
 Frank O. Lewis  
 Dyer Smith

*Inventor:*  
 Alexander N. Pierman  
 by Frank L. Dyer  
 Att'y.

# UNITED STATES PATENT OFFICE.

ALEXANDER N. PIERMAN, OF NEWARK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH-REPRODUCER.

1,036,329.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Application filed November 19, 1908. Serial No. 463,345.

### *To all whom it may concern:*

Be it known that I, ALEXANDER N. PIERMAN, a citizen of the United States, and a resident of Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Reproducers, of which the following is a description.

My invention relates to phonograph reproducers, and has for its object the provision of an improved mounting for the stylus lever, in order that the same may have great freedom of movement in tracking the grooves of the sound record, and in order that chatter of the stylus in the record groove due to inertia and lack of balance of the moving parts, may be obviated.

More particularly, the object of my invention is to provide a mounting for the stylus, which shall permit the latter to be used in connection with records having two hundred threads to the inch, and track the same faithfully and without injury to the record or the stylus.

While the stylus mounted in the manner of my invention is equally well adapted for use in connection with records having one hundred or some other number of threads per inch, the requirement of great facility of movement of the stylus lever, both in a direction parallel to and transverse to the record groove, is particularly important in the case of the two hundred thread record, or other record having a great number of threads per inch, owing to the thin walls between the record grooves, which might be broken down, or jumped across, by a stylus, the parts moving with which have considerable inertia, and to the character of the record grooves generally. Accordingly, a stylus mounting of the least possible inertia and the greatest possible balance is desirable. This is provided for in my invention by mounting the stylus lever on a member, preferably the floating weight, which is so shaped as to be symmetrical with respect to an axis upon which it is mounted to allow rotation or lateral movement in a plane transverse to the record grooves, the said member also being permitted to shift longitudinally of the said axis, to allow movement of said stylus in a direction

parallel to said grooves. A weight or member so mounted is evenly balanced and can not be jarred from its position by a blow on the phonograph transverse to the direction of the grooves in the sound record, whereas such a blow delivered on a machine employing the hinged floating weight, well known in the art, would move the same violently in a direction transverse to the record grooves.

Other objects of my invention are the provision of improved details of construction and combination of parts.

In order that my invention may be more clearly understood, reference is hereby made to the accompanying drawings, illustrating a preferred form thereof, in which—

Figure 1 is a central vertical section through a reproducer equipped with my invention, and Fig. 2 is a bottom view thereof.

The sound box 1 is formed by the member 2, which has formed integrally therewith the neck 3, to which the phonograph horn may be connected. The diaphragm 4 is clamped in place between gaskets 5 and 6, which are secured in place between the outer periphery of member 2 and member 7 of body 8 of the reproducer, said member 7 extending parallel to and a short distance below the diaphragm 4. The body 8 is provided above member 2 with an internal screw thread to which the ring 9 formed with an external screw thread is adapted to be fitted, this ring being screwed into place to firmly hold the body of the reproducer, the diaphragm and member 2 together.

A short stud 10 is mounted as by being screwed into a small hole in body member 7, this stud 10 projecting at right angles to member 7 below the same, forming the axis for cylindrical floating weight 11, which is formed with a central vertical opening 12 of a slightly larger diameter than the stud 10. Floating weight 11 is likewise provided with a cylindrical passageway 13 parallel to opening 12. Weight 11 is provided on its under side with a pair of ears or lugs 14, preferably formed integral with the weight, through which extends the screw 15, on which is pivotally mounted stylus lever 16 carrying stylus 17. The lugs 14 are preferably so placed that pin or screw 15 ex-



tends directly below and across opening 12, stylus lever 16 extending diametrically across said opening at right angles to pin 15. The end of stylus lever 16 distant from stylus 17 is connected by link 18 to the center of the diaphragm 4, to which it is fastened by any appropriate means. Body portion 8 of the reproducer is provided with a flange 19 from the bottom of which extends downwardly at one point stirrup 20. The floating weight is mounted with axial passage 12 embracing stud 10, so that the weight 11 is free to rotate about the stud, and also to move longitudinally of the same. The extent of both these movements is determined by the engagement of pin or screw 21, which extends from the lower periphery of the weight, with the stirrup. The parts are so proportioned that passage 13 through the cylindrical weight is located directly below the center of the diaphragm when the weight is mounted on stud 10, passage 13 then being in line with opening 22 through body member 7 of the reproducer, thus affording a continuous passage way for the link 18. The stylus lever 16 is mounted with its axis 15 directly below the axis of symmetry and rotation of the weight 11. The lever arm of link 18 is preferably considerably longer than that of stylus 17, so that the movement of the stylus in the record groove may be considerably amplified in the diaphragm.

With this construction it is to be noted that the floating weight slides freely on stud 10, always so moving in a plane perpendicular to the diaphragm, allowing the stylus to perfectly follow the up and down variations of the record groove, while the weight on which the stylus is mounted being free to rotate about its axis always allows the stylus the greatest freedom in movements transvers to the record groove in tracking the same. The construction of weight 11 in the form shown and mounted in the manner shown provides a well balanced mounting for the stylus lever and by which lateral movement can be imparted to the stylus with the minimum of resistance to such movement. The weight as thus formed is also easily manufactured, and is so located as to take up little room and not be in the way.

It is understood that my invention is not limited by the precise device or construction shown, but may be varied within the scope of the appended claims without departing from the spirit of my invention.

Having now described my invention, what I claim and desire to secure by Letters Patent is as follows:

1. In a phonograph reproducer, the combination with a diaphragm, of a floating weight mounted free to rotate around and to shift longitudinally of, an axis, means

limiting movement of said weight to such rotation and shift a stylus lever supported pivotally by said weight, and a connection from said lever to said diaphragm, substantially as described.

2. In a phonograph reproducer, the combination with a diaphragm, of a member a mounting therefor permitting the same to rotate around, and to shift longitudinally of, an axis, a stylus lever supported pivotally by said member, and a connection from said lever to said diaphragm, substantially as described.

3. In a phonograph reproducer, the combination with a diaphragm, of a floating weight mounted free to rotate around and to shift longitudinally of, an axis, at right angles to the diaphragm, means limiting movement of said weight to such rotation and shift a stylus lever supported pivotally by said weight, and a connection from said lever to said diaphragm, substantially as described.

4. In a phonograph reproducer, the combination with a diaphragm, of a member a mounting therefor permitting the same to rotate around, and to shift longitudinally of, an axis, at right angles to the diaphragm, but preventing other movement thereof a stylus lever supported pivotally by said member, and a connection from said lever to said diaphragm, substantially as described.

5. In a phonograph reproducer, the combination with a diaphragm, of a member mounted free to rock upon an axis, and to shift longitudinally thereof, means limiting movement of said member to such rocking and shift a stylus lever supported upon said member and free to rock upon an axis intersected by a prolongation of the axis of said member, and a connection from said lever to said diaphragm, substantially as described.

6. In a phonograph reproducer, the combination with a diaphragm of a member a mounting therefor permitting the same to rock upon an unchanging axis but preventing bodily shift of the same at right angles to said axis, a stylus lever supported upon said member and free to rock upon an axis intersected by a prolongation of the axis of said member, and a connection from said lever to said diaphragm, substantially as described.

7. In a phonograph reproducer, the combination with a diaphragm, of a member a mounting therefor permitting the same to rock upon an unchanging axis, and a longitudinal stylus lever pivoted upon said member and free to rock, said lever extending diametrically across the axis of said member, and a connection from said lever to said diaphragm, substantially as described.

8. In a phonograph reproducer, the combination with a diaphragm, of a body mem-

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ber below and parallel to the diaphragm, cylindrical means mounted in said member, a floating weight mounted to rotate about the axis of said means and to slide longitudinally of the same, a stylus lever supported pivotally by said weight, and a connection from said lever to said diaphragm, substantially as described.

9. In a phonograph reproducer, the combination with a diaphragm, of a body member below and parallel to the diaphragm, a stud mounted in said member, a floating weight mounted to rotate upon and slide longitudinally of, said stud, a stylus lever supported pivotally by said weight, and a connection from said lever to said diaphragm, substantially as described.

10. In a phonograph reproducer, the combination with a diaphragm, of a member mounted for movement in planes invariably parallel to and at right angles to the diaphragm, means for limiting such movements, a stylus lever mounted pivotally on said member, and a link connecting the said

lever to the diaphragm, substantially as described.

11. In a phonograph reproducer, the combination with a diaphragm, of a floating weight mounted to rock about its axis of symmetry, a stylus lever supported upon said weight and free to rock upon an axis intersected by a prolongation of the axis of said weight, and a connection from said lever to said diaphragm, substantially as described.

12. In a phonograph reproducer, the combination of a diaphragm, a floating weight invariably substantially parallel to the normal position of the diaphragm mounted to rotate about an axis normal to the diaphragm, and a stylus lever supported by the weight, substantially as described.

This specification signed and witnessed this 16 day of Nov. 1908.

ALEXANDER N. PIERMAN.

Witnesses:

DYER SMITH,

ANNA R. KLEHM.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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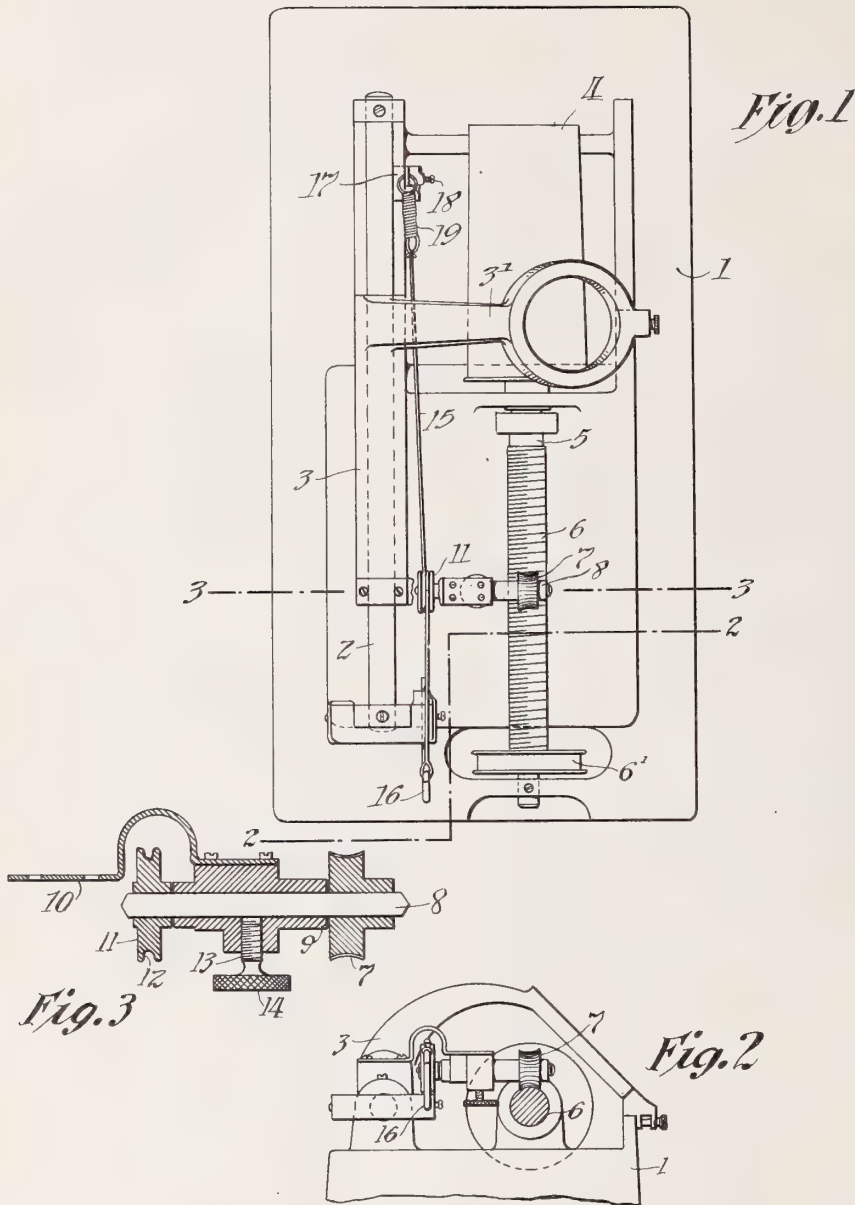




C. N. WURTH.  
FEEDING MECHANISM FOR PHONOGRAPHS AND OTHER MACHINES.  
APPLICATION FILED FEB. 2, 1911.

1,036,403.

Patented Aug. 20, 1912.



*Witnesses:*  
Frederick Sachmann,  
A. B. Dresske

*Inventor:*  
Charles N. Wurtz  
by Frank L. Dyer  
his Atty.

# UNITED STATES PATENT OFFICE.

CHARLES N. WURTH, OF ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS,  
TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A  
CORPORATION OF NEW JERSEY.

FEEDING MECHANISM FOR PHONOGRAPHS AND OTHER MACHINES.

1,036,403.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Application filed February 2, 1911. Serial No. 606,089.

*To all whom it may concern:*

Be it known that I, CHARLES N. WURTH, a citizen of the United States, residing at Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Feeding Mechanism for Phonographs and other Machines, of which the following is a description.

My invention relates to mechanical movements and more particularly to means for imparting a progressive movement to the carriage which carries the reproducer or recorder of a phonograph, whereby the same is fed transversely to the direction of movement of the surface of the record and the stylus traverses a spiral path on the record.

In ordinary phonographs now in use, it has been usual to provide a feed screw having a pitch of substantially one one-hundredths of an inch. As records can now be produced with a very much smaller pitch, preferably one two-hundredths of an inch, and as it is impracticable to manufacture feed screws with so small a pitch, it is my object to provide means whereby the ordinary phonograph may be adapted for the recording or reproduction of records having either of the above, or any other desired pitch. This object I accomplish by the production of improved means whereby the carriage may be advanced either directly by the rotating feed screw, as has hitherto been the practice, or whereby, at the will of the operator, the carriage may be advanced at each revolution of the feed screw, a distance bearing any desired ratio to the pitch of the said screw.

Another object of my invention is to provide a simple attachment adapted to be readily applied to existing phonographs to adapt the same by a simple manipulation for use with records of different pitches.

With these and other objects in mind, my invention consists of the features herein-after set forth and claimed.

In order that my invention may be more fully understood, attention is hereby directed to the accompanying drawing, forming a part of this specification and in which—

Figure 1 is a plan of a phonograph provided with a feeding device constructed in accordance with my invention; Fig. 2 is an

end elevation of the device shown in Fig. 1, the feed screw being shown in section taken on the line 2—2 of Fig. 1; and Fig. 3 is a section of my improved feeding device taken on the line 3—3 of Fig. 1.

Corresponding parts are designated by the same reference numerals in the several views.

The phonograph shown is of the Edison type and comprises the usual body 1 having a back rod 2 on which the traveling carriage 3 provided with an arm 3' for supporting a recorder or reproducer is movably mounted. The mandrel 4 is mounted upon the main shaft 5 which is provided with a feed screw 6 which, as has been explained, ordinarily has a pitch of one one-hundredth of an inch, although a screw of different pitch may be used. A pulley 6' is secured to the shaft 5.

The present invention comprises a worm wheel 7 for engagement with the feed screw 6, the said worm wheel being secured to one end of a shaft 8 which is supported in a suitable bearing 9, which in turn is carried by the traveling carriage 3. The bearing 9 is detachably connected to the traveling carriage by the resilient member 10. To the opposite end of the shaft 8 from that carrying the worm wheel 7 is secured a pulley 11 having a groove 12 in its periphery. A thumb screw 13 provided with a knurled head 14 is carried by the bearing 9 and is adapted to be brought into contact with the shaft 8 whereby the latter may be secured against rotation. A cord 15 or any other suitable equivalent means is fixed at one end to the spring hook 16 carried by the body 1 and is passed around the pulley 11, the other end of the cord being fixed to the body by means of the block 17 movable along the body and provided with a set screw 18 whereby it may be secured in position. A tension spring 19 is interposed between the end of the cord 15 and the block 17. By means of the adjustable block 17 and the spring 19, any desired amount of tension may be imparted to the cord, the resiliency of the spring preventing the cord from being subjected to excessive strains. As shown in Figs. 1 and 2, the pulley 11 and the cord 15 are located in proximity to the back rod 2, so that the arm 3' may be raised through a considerable angle without interference from the cord 15.



The operation of my device is as follows:—Power being applied to the pulley 6', the feed screw and the mandrel will revolve at a certain speed. When the thumb screw 13 is brought into contact with the shaft 8, the worm wheel is held against rotation, and acts, on the rotation of the feed screw, precisely like an ordinary feed nut; and the carriage is advanced at each revolution of the feed screw a distance equal to the pitch of the said screw. During the operation of the device as described above, the cord 15 slips over the pulley as the worm wheel advances, such operation being facilitated by the resiliency imparted to the cord by the spring 19. When it is desired to employ my improved device with records having a different pitch from that of the feed screw, the thumb screw 13 is moved out of engagement with the shaft 8. The feed screw being then actuated, the worm wheel 7 and pulley 11 are revolved, the pulley 11 is shifted longitudinally of the record by its engagement with the cord 15, and the carriage is advanced at each rotation of the feed screw a distance depending upon the pitch diameters of the worm wheel 7 and the pulley 11.

While I have described my invention as applied to a phonograph for producing the desired feed of the carriage, it is obviously not limited to such use, and may be applied to any mechanism whatever for converting rotary movement into progressive lineal movement.

Having now described my invention, what I claim as new and desire to secure by Letters Patent of the United States is as follows:—

1. In a device of the class described, the combination with a traveling carriage, of means for moving said carriage in the same direction at any one of a plurality of different speeds, said means comprising a flexible member, driving means engaging said member to move said carriage at one of said speeds, and means for rendering said driving means inoperative while the carriage is driven at a different speed, substantially as described.

2. In a device of the class described, the combination with a traveling carriage, of means for moving said carriage in the same direction at any one of a plurality of different speeds, said means comprising a flexible member, rotary driving means engaging said member to move said carriage at one of said speeds, and means for securing said driving means against rotation, said flexible member being adapted to slip with respect to said driving means when the latter is held against rotation, substantially as described.

3. In a device of the class described, the combination of a frame, a carriage movable

thereon, a feed screw and means driven by said feed screw for moving said carriage in the same direction on said frame at any one of a plurality of different speeds, said means comprising a flexible member, rotary driving means engaging said member to move said carriage at one of said speeds, and means for securing said driving means against rotation, said flexible member being adapted to slip with respect to said driving means when the latter is held against rotation, substantially as described.

4. In a device of the class described, the combination with a traveling carriage, of means for moving said carriage in the same direction at any one of a plurality of different speeds, said means comprising a resiliently supported flexible member, driving means engaging said member to move said carriage at one of said speeds, and means for rendering said driving means inoperative while the carriage is driven at a different speed, substantially as described.

5. In a device of the class described, the combination of a frame, a carriage movable thereon, a feed screw, a flexible member secured to said frame, a worm wheel on said carriage and meshing with said feed screw, means actuated from said worm wheel and frictionally engaging with said flexible member for moving said carriage on said frame, and releasable means for holding said worm wheel against rotation, said flexible means being adapted to slip with respect to said first named means when said worm wheel is held against rotation, substantially as set forth.

6. In a device of the class described, the combination of a frame, a carriage movable thereon, a feed screw, a flexible member secured to said frame, a worm wheel on said carriage and meshing with said feed screw, a pulley actuated from said worm wheel and engaged by said flexible member, and releasable means for holding said worm wheel against rotation, substantially as set forth.

7. In a device of the class described, the combination of a frame, a carriage movable thereon, a feed screw, a worm wheel on said carriage and meshing with said feed screw, a pulley actuated from said worm wheel, a cord secured at its ends to said frame and passing over said pulley, and releasable means for holding said worm wheel against rotation, substantially as set forth.

8. In a device of the class described, the combination of a frame, a carriage movable thereon, a feed screw, a shaft mounted in said carriage, a worm wheel secured to said shaft and meshing with said feed screw, a pulley also secured to said shaft, a cord resiliently secured to said frame, and passing over said pulley and a thumb screw mounted in said carriage and adapted to

hold said worm wheel against rotation, substantially as set forth.

9. In a device of the class described, the combination with a feed screw and traveling carriage, of a worm wheel rotatably mounted on said carriage, a flexible member secured to said frame, means rotated by said worm wheel and cooperating with said flexible member, and means for rendering said first named means inoperative, substantially as set forth.

10. In a device of the class described, the combination with a feed screw and traveling carriage, of a worm wheel rotatably mounted on said carriage, a cord resiliently secured to said frame, a pulley rotated from said worm wheel and engaged by said cord, and means for holding said worm wheel against rotation to cause said cord to slip over said pulley and said carriage to be advanced directly by said feed screw, substantially as set forth.

11. In a device of the class described, the combination of a frame, a carriage movable thereon, a feed screw, a worm wheel on said

carriage and meshing with said feed screw, a pulley actuated from said worm wheel, a flexible member passing over said pulley, and means for resiliently securing said flexible member to said frame, said means being adjustable to vary the tension of said flexible member, substantially as described.

12. In a device of the class described, the combination of a frame, a carriage movable thereon, a flexible member, means for resiliently securing said flexible member to said frame, said means being adjustable to vary the tension of said flexible member, means mounted on said carriage and cooperating with said flexible member for moving said carriage on said frame, and means for actuating said last named means, substantially as described.

This specification signed and witnessed this 31st day of January 1911.

CHARLES N. WURTH.

Witnesses:

FREDERICK BACHMANN,  
ANNA R. KLEIM.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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O. ARNOLD.  
PHONOGRAPH.

APPLICATION FILED JULY 31, 1908.

1,036,413.

Patented Aug. 20, 1912.

2 SHEETS—SHEET 1.

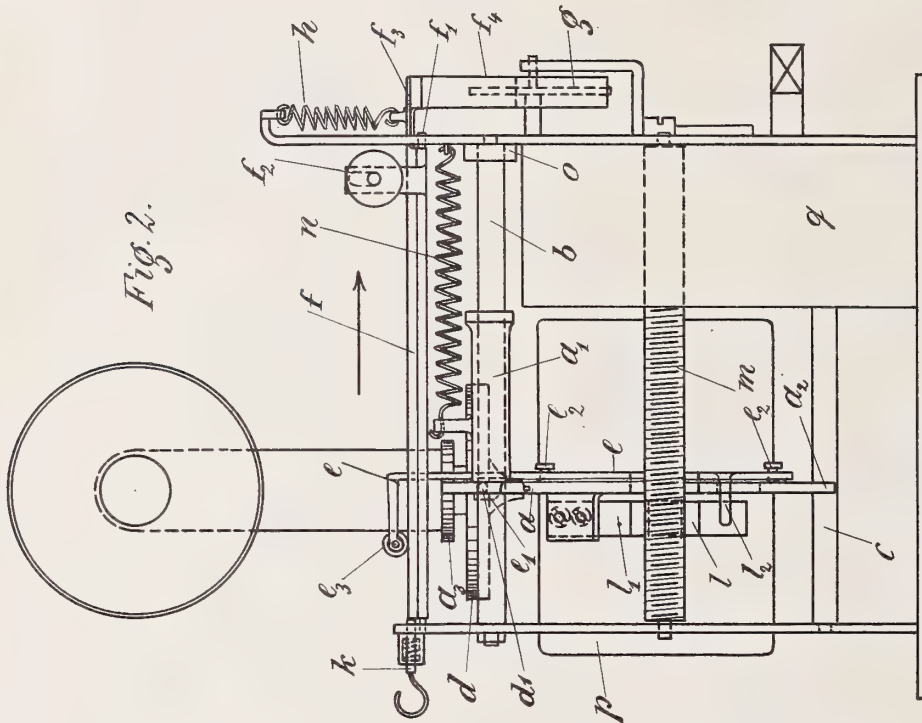
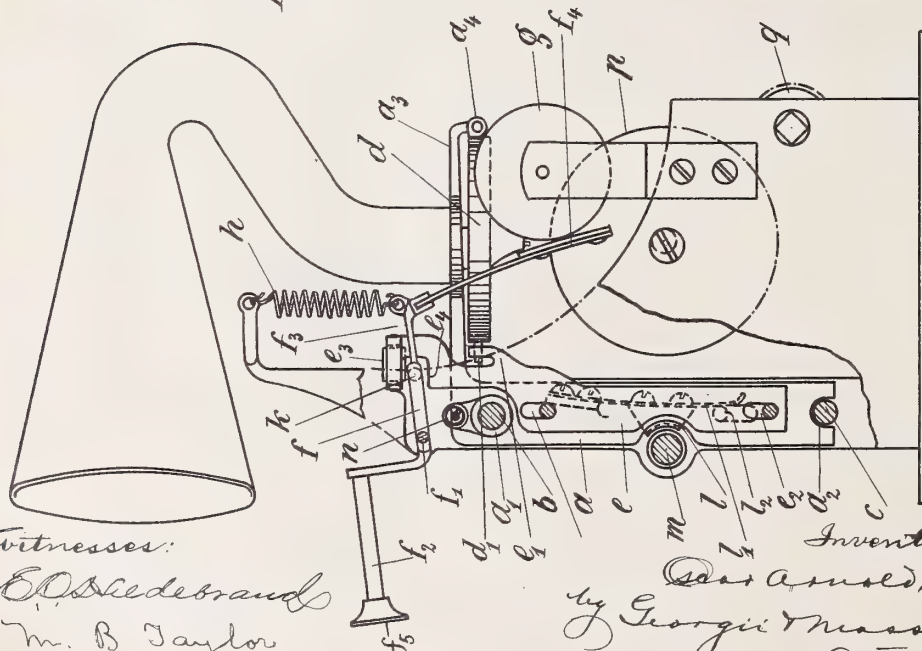


Fig. 1.



Witnesses:  
C. B. Schildebrand  
Wm. B. Taylor

Inventor:  
Oscar Arnold,  
by George D. Massie  
attorney





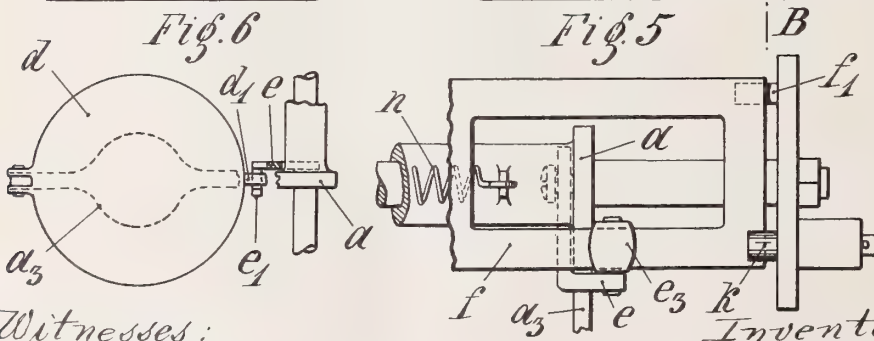
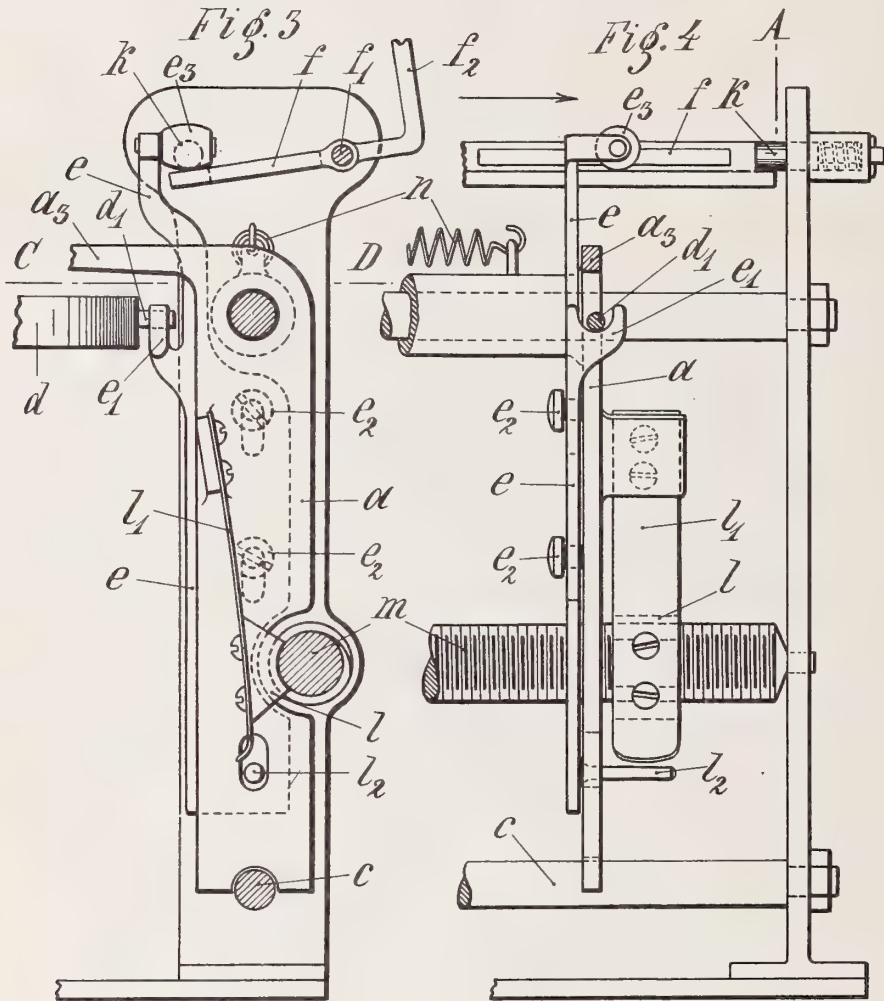
O. ARNOLD.  
PHONOGRAPH.

APPLICATION FILED JULY 31, 1908.

1,036,413.

Patented Aug. 20, 1912.

2 SHEETS—SHEET 2.



Witnesses:  
*E. J. Hildebrand*  
*M. B. Taylor.*

Inventor:  
*Oscar Arnold,*  
by *Max [Signature]*  
his Attorney.

# UNITED STATES PATENT OFFICE.

OSCAR ARNOLD, OF NEUSTADT, COBURG, GERMANY.

## PHONOGRAPH.

1,036,413.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Application filed July 31, 1908. Serial No. 446,352.

*To all whom it may concern:*

Be it known that I, OSCAR ARNOLD, citizen of Germany, residing at Neustadt, in the Duchy of Coburg, in the German Empire, have invented certain new and useful Improvements in Phonographs; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to phonographs and particularly to an improvement therein whereby at the end of the particular record the reproducing apparatus is automatically returned to the starting point, ready for a second reproduction upon the release of the driving mechanism.

A phonograph constructed according to this invention is particularly well adapted for use in connection with talking dolls and like toys in which the speaking apparatus is built into the doll body and is caused to operate by the pressure of a button.

The invention, as hereinafter more fully described and as particularly set out in the accompanying claims, is illustrated in one embodiment in the accompanying drawing, in which:

Figure 1 is a side view partly in section; Fig. 2 is a front elevation; Fig. 3 an enlarged detail view in sectional side elevation taken on the line A—B, Fig. 4; Fig. 4 a front elevation of the same; Fig. 5 a plan view of the part shown in Fig. 4; and Fig. 6 a sectional plan taken on the line C—D, Fig. 3.

Referring to the drawings, the sound box carrier consists of an angle piece, of which the vertical arm *a* is provided in its upper portion with a guide sleeve *a*<sub>1</sub> and in its lower portion with a fork *a*<sub>2</sub>, embracing and traveling on guide rods *b* and *c* respectively. The horizontal arm *a*<sub>3</sub> of the carrier extends over the sound box *d* in the form of a loop (see Fig. 6) and at its extremity *a*<sub>4</sub> it is pivoted to the sound box, which latter at its opposite side rests by means of a stud *d*<sub>1</sub> in a notch *e*<sub>1</sub> of the bar *e* which is mounted on the carrier *a* and vertically movable thereon by virtue of its slot-and-pin connections *e*<sub>2</sub>, *e*<sub>2</sub>. (See particularly Figs. 3 and 4.) This bar *e* is moved by means of a rocker *f* fulcrumed at *f*<sub>1</sub>, extending into a recess *e*<sub>4</sub> of the bar *e*, and overlaid and held down by a guide-roll or traveler *e*<sub>3</sub>, connect-

ed with the sound-box by being mounted on the bar *e*. Said rocker *f* serves for and is formed as a track for the guide roll *e*<sub>3</sub> (see Figs. 2, 4 and 5), and is formed at its right-hand end as a two-arm lever whose one arm *f*<sub>2</sub> carries a button *f*<sub>5</sub>, while its other arm *f*<sub>3</sub> carries a spring-brake *f*<sub>4</sub>, in frictional contact with the regulator-pulley *g*. To the arm *f*<sub>3</sub> is attached a tension spring *h* secured at its other end to a standard fixed to the machine frame, said spring *h* serving to normally hold the rocker in its upper position.

In the frame at the left end of the rocker *f* is mounted a spring catch *k*, which, as the rocker *f* is moved downward by pressure on the button *f*<sub>5</sub>, slips over the rocker and holds the same down, at which time the catch *k* is in the plane of the roll *e*<sub>3</sub>, whose function is to push back the spring catch when the carrier *a* and the bar *e* arrive at their extreme left-hand position, Fig. 2.

On the carrier *a* is mounted a leaf spring *l*<sub>1</sub> bearing a threaded segment *l* normally held by a pin *l*<sub>2</sub> secured to and extending from bar *e* as best seen in Figs. 3 and 4, out of engagement with the threaded drive spindle *m* but tending to operatively engage the same so as to move the sound box forward over the record. A return spring *n* secured at its right end to the sound box, serves to return the apparatus to the starting point, a buffer *o* of leather, rubber or the like preventing any undue shock in the return movement. The driving of the spindle *m* and of the record *p* is effected in any ordinary manner by a motor *q* through suitable gearing not shown.

The operation is as follows: Assuming the parts to be at rest and the spring *n* to have drawn the sound box and other mechanism to the starting point to the right, the spring *h* holding the brake *f*<sub>4</sub> in the operative position to prevent movement of the parts. When the button *f*<sub>5</sub> is pressed, the rocker *f* descends, releasing the brake *f*<sub>4</sub> and starting the motor. At the same time the bar *e* is depressed so as to disengage the pin *l*<sub>2</sub> from the spring *l*<sub>1</sub>, thereby allowing the threaded segment *l* to engage the drive spindle *m*. Simultaneously with the depressing of the bar *e*, the sound box *d* drops with its needle into contact with the record *p*, and the catch *k* being released from the roller *e*<sub>3</sub> springs into place above the rocker *f* to hold it down. Thereupon the phono-



graph reproduces the record to its end, as the carrier *a* and the sound box travel from right to left, Fig. 2. When the carrier has arrived at the end of its stroke to the left the roll *c*<sub>3</sub> strikes the catch *k* and pushes it back, releasing the rocker *f* which is drawn up by the spring *h*, braking the motor and releasing the threaded segment *l* from the spindle *m*, when the tensioned spring *n* immediately returns the mechanism to the starting point, where it assumes a position of rest until the button *f*<sub>5</sub> is again pressed.

Having thus fully described my invention, what I claim is:—

1. In a phonograph, the combination, with a record, a sound-box adapted to travel with respect to the record, a motor, and a drive-spindle connected with the motor, and means for causing the sound-box to engage the record and the drive-spindle, of a rocker arranged to disengage the sound-box from the record and the drive-spindle, a brake adapted to arrest the motor, a connection between the rocker and the brake to apply the brake simultaneously with the disengagement of the sound-box from the spindle and record, means for locking the rocker when the sound-box is engaged with the spindle, and means for tripping said locking means at the end of the travel of the sound-box, whereby the rocker is permitted to act.

2. In a phonograph, the combination with a record, a motor, a drive spindle connected therewith, and a sound-box adapted to engage the drive-spindle and to travel with respect to the record, of a rocker provided with means for simultaneously disengaging the sound-box from the record and the drive-spindle and provided with a guide-way, yielding means directly connected to the rocker for tilting the same into its inoperative position, a traveler arranged to move over the guide-way, a catch for locking the rocker when the sound-box is in engagement with the record and the spindle and arranged in the path of the traveler, a lever arranged on the rocker for pushing it into its operative position against the stress of the yielding disengaging means, and means independent of and arranged laterally of the drive-spindle for automatically returning the sound-box to its starting position when the catch is tripped by the traveler.

3. In a phonograph, the combination, with a record, a motor to drive the same, a drive-spindle connected to the motor, a brake adapted to arrest the motor, and a sound-box adapted to engage the drive-spindle and the record, of a rocker arranged to simultaneously disengage the sound-box from the drive-spindle and the record and to apply the brake, means for locking the rocker when the sound-box is engaged with the record

and the drive-spindle and the brake is released, and means for tripping said locking means when the sound-box has reached the end of its travel, said means being mounted on the rocker, and means to automatically return the sound-box to the starting point when the locking means are tripped.

4. In a phonograph, the combination, with the sound box, the record, the motor, and the drive spindle, of a rocker arranged to permit the connection of the drive spindle with the sound box, a catch to hold the rocker in its operative position, and means carried with the sound box and arranged at the limit of its travel to release the catch, a lever secured to the rocker, a button mounted on one arm of the lever, the brake attached to the second arm of the lever and adapted to arrest the motor, a spring also attached to the second lever arm and tending to apply the brake and lift the rocker when the catch is released, means connected with the rocker to release the sound box from the spindle when the catch is released, and means to automatically return the sound box to the starting point.

5. In a phonograph, the combination, with the sound box, the record, the motor, and the drive spindle, of a threaded segment, a spring pressing the segment into engagement with the spindle, a bar provided with a pin to press the spring out of operation, a rocker arranged to lift the bar to release the segment from the spindle, a spring tending to operate the rocker, a catch to hold the rocker out of operation, means carried with the sound box to release the catch at the limit of its travel to permit the rocker to lift the bar to disconnect the driving spindle, and means to return the sound box to the starting point.

6. In a phonograph, the combination, with the sound box, the record, the motor, and the drive spindle and a brake adapted to arrest the motor, of a threaded segment, a spring pressing the segment into engagement with the spindle, a bar provided with a pin to press the spring out of operation, a rocker arranged to lift the bar to release the segment from the spindle and apply the brake, a spring tending to operate the rocker, a catch to hold the rocker out of operation, means carried with the sound box to release the catch at the limit of its travel to permit the rocker to lift the bar to disconnect the driving spindle and simultaneously apply the brake, and means to return the sound box to the starting point.

7. In a phonograph, the combination, with the sound box, the record, the motor, and the drive spindle, of a threaded segment, a spring pressing the segment into engagement with the spindle, a bar provided with a pin to press the spring out of operation, a rocker arranged to lift the bar to release the seg-

ment from the spindle, a spring tending to  
operate the rocker, a catch to hold the rocker  
out of operation, means carried with the  
sound box to release the catch at the limit of  
5 its travel to permit the rocker to lift the bar  
to disconnect the driving spindle, and means  
to return the sound box to the starting point,  
the sound box having a swinging connection  
with the bar, whereby as the bar drops to  
10 permit a connection between the drive spin-

dle and sound box, the latter will also drop  
into operative contact by its needle with the  
record.

In testimony whereof I hereunto affix my  
signature in the presence of two witnesses. 15

OSCAR ARNOLD.

Witnesses:

OTTO LAUB,  
OLGA HINGE.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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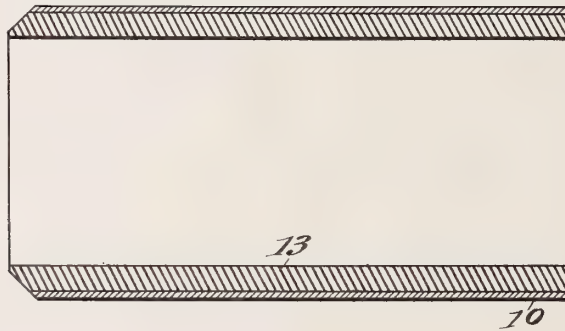


J. W. AYLSWORTH.  
PHONOGRAPH RECORD.  
APPLICATION FILED APR. 4, 1907.

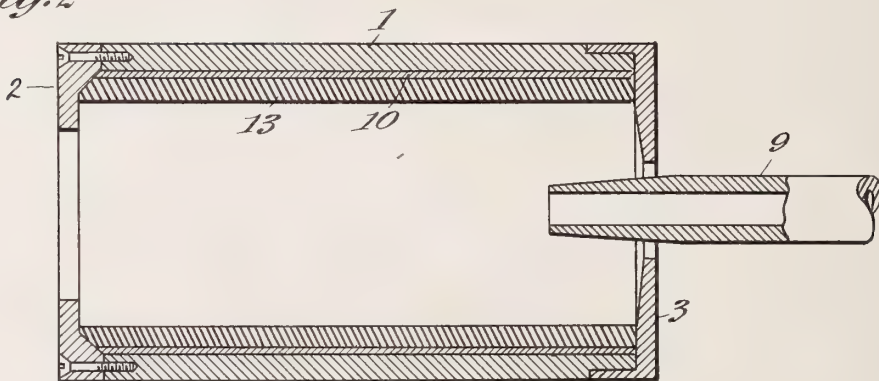
1,036,415.

Patented Aug. 20, 1912.

*Fig. 1*



*Fig. 2*



*Witnesses:*  
*Frank D. Lewis*  
*Anna P. Helms*

*Inventor:*  
*Jonas W. Aylsworth*  
*by Frank L. Spence*  
*Atty.*

# UNITED STATES PATENT OFFICE.

JONAS W. AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH-RECORD.

1,036,415.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Original application filed May 31, 1906, Serial No. 319,422. Divided and this application filed April 4, 1907. Serial No. 366,247.

*To all whom it may concern:*

Be it known that I, JONAS W. AYLSWORTH, a citizen of the United States, residing in East Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Records, of which the following is a description.

This application is a division of Patent No. 855,606 granted June 4, 1907.

My invention relates to improved duplicate phonograph records, which can be manufactured very cheaply and which will be of superior character.

I have also devised an improved process and apparatus designed especially for producing the improved records, although they may be employed for the manufacture of records of other types. The process referred to forms the subject matter of the patent of which this is a division.

The improved record which constitutes the present invention is a composite cylindrical structure having an outer layer of a tough, smooth, amorphous material, in which the record surface is formed and from which a smooth and brilliant reproduction can be obtained, and a main body or support therefor composed of a very cheap and tough material unsuitable itself for receiving a record surface, the two layers being welded together so as to constitute practically a single homogeneous structure, as I will more fully hereinafter describe and claim.

The improved process is one in which the material in a molten state or in solid or powdered form is introduced into a rapidly rotating mold, as I describe in patents numbered 855,605, 855,553 and 855,554, all granted on June 4, 1907, the outer layer being first formed by the centrifugal force developed and, when the material thereof is sufficiently set but preferably while still slightly plastic, the material to constitute the inner or main layer is introduced so as to be intimately welded to the outer layer. The process also contemplates the carrying on of operations by which the interior of the record may be suitably developed to fit the supporting mandrels of talking machines of the phonograph type, although if an ex-

panding mandrel is employed as disclosed in the Patent No. 855,604 granted June 4, 1907, of Aylsworth and Dyer, no separate finishing operation is necessary, since when the records are removed from the molds after being chilled therein, they will, as an inherent result of the process, be formed with perfectly smooth cylindrical bores.

The apparatus used in the above process is essentially of the type disclosed in my Patent No. 855,605, above referred to, except that I make use of supplementary mechanism for finishing the bores of the records, when this is desirable.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal sectional view of the improved duplicate phonograph record, Fig. 2, a similar view of the rotating mold, showing the formation of the record thereon.

In both of the views corresponding parts are represented by the same numerals of reference.

The mold is of tubular form, carrying on its bore the representation in relief of the record to be duplicated and is produced in any suitable and convenient way, preferably by a process of vacuous deposit, as is well known in the art. This mold is provided with a stationary end flange 2, carrying the usual engraved matter for identifying the record, and with a removable end flange 3, adapted to be secured in place in any suitable way. While the record is being formed in the mold, the latter is rotated so as to cause the material to be uniformly distributed over the record surface by reason of the centrifugal force developed. This may be accomplished by any suitable mechanism such as that shown in Patent No. 855,606, above referred to.

In the process described in the patent above referred to, material may be introduced within the mold in various states, and the mold treated in various ways, as described in the said patent, the result being in each case to produce the product herein described and claimed. In whatever way or condition the material is introduced



within the mold, as described in the said patent, the mold is rotated at the necessary speed to develop sufficient centrifugal force, and the material is distributed uniformly over the record surface, so as to form a relatively thin layer 10, which during the time of its distribution will be maintained in a fluid condition so as to displace any air or gas bubbles and result in a very perfect impression being taken. In the process of the patent above referred to resulting in the product herein described and claimed, this outer or surface layer of the record is caused to set or harden by means there described. When the material of the layer 10 has been thus set, and preferably, while still slightly plastic and sticky, the material for the inner layer or body 13 of the record is introduced, the mold being still rotated, whereby the material will distribute itself uniformly over and with respect to the surfacing layer 10, and be intimately welded and associated therewith, so as to form practically a continuous structure. The weld or joint thus formed is autogenous, the composite product formed by a union of this character being different from one in which an intermediate layer of cement material is employed, as in the latter case, the cement or solution employed penetrates within and permeates the composition to a certain extent. Unless the melting point of the surfacing layer 10 is considerably higher than the melting point of the material comprising the body 13, it will not be practicable to introduce the material for the latter layer in solid form, since it is important that after the surfacing layer has been properly distributed it should retain its solidified condition. Therefore, I introduce a material for the inner layer in the molten state and continue the rotation of the mold until the material has set sufficiently to retain its cylindrical form, as described in my Patent No. 855,606 above referred to. The record may be finished as described in this patent. Many materials, suitable for the formation of at least the inner portion of duplicate sound records, are so viscid and sticky when molten or in a plastic condition that any attempt to cut them in that state in the finishing of the record would be impossible. A method is described in my Patent No. 855,606 above referred to, however, by which material is displaced by means of a

rotatable mandrel, whereby the bores of records composed of extremely viscid materials can be effectively finished. Accordingly, it is possible to use as a material for the inner layer of my record a material which is sticky or viscid when molten and which cannot, therefore, be effectively cut.

As I have already indicated, the surfacing layer 10 of the record should be composed of a hard and extremely smooth material, so as to resist wear of the reproducer stylus, and eliminate scratching noises as much as possible. This surfacing layer may be made quite thin, so that a relatively expensive material for the same can be effectively used. An example of a suitable composition from which the surfacing layer may be formed is the special transparent composition described in my Patent No. 676,111 dated June 11th, 1910.

A suitable example of material from which the inner or body layer may be formed, and which while being extremely cheap is at the same time tough and of approximately the same coefficient of expansion as the material above referred to, is the following: asphalt 80 parts, stearin pitch 20 parts. In the make up of this composition the ingredients are melted and intimately mixed.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. An improved duplicate cylindrical sound record, comprising a surfacing layer of a very smooth amorphous material carrying the record impression, and an interior layer intimately welded thereto and formed of a mixture of asphalt and stearin pitch, substantially as set forth.

2. An improved duplicate cylindrical sound record, comprising a surfacing layer of a very smooth amorphous material carrying the record impression, and an interior layer intimately welded thereto and formed of a mixture of asphalt and stearin pitch in which the asphalt greatly predominates, substantially as set forth.

This specification signed and witnessed this 3rd day of April 1907.

JONAS W. AYLSWORTH.

Witnesses:

FRANK D. LEWIS.

ANNA R. KLEHM.

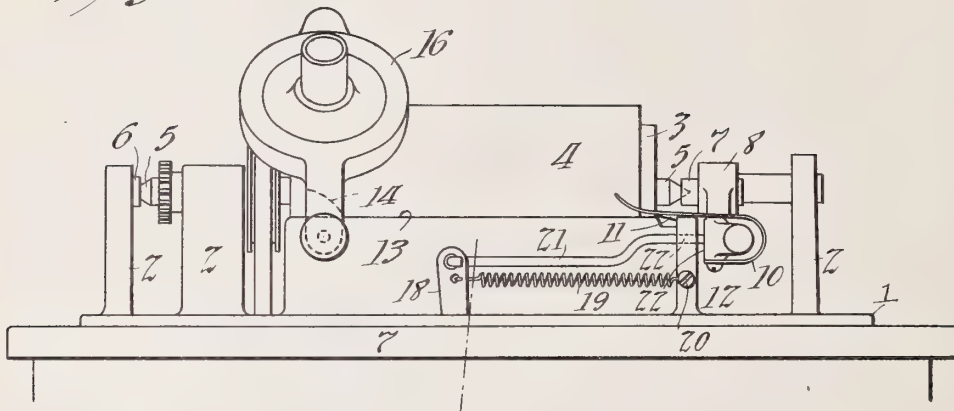


L. A. BROWN.  
 PHONOGRAPH.  
 APPLICATION FILED APR. 2, 1909.

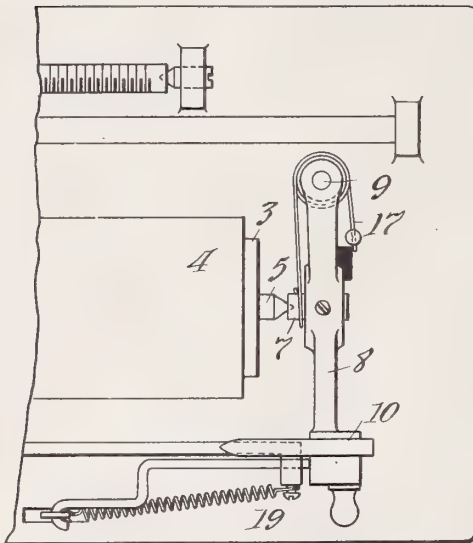
1,036,440.

Patented Aug. 20, 1912.

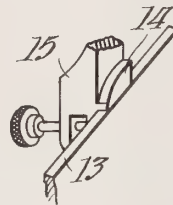
*Fig. 1*



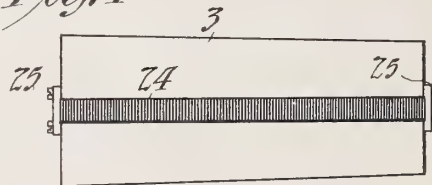
*Fig. 2*



*Fig. 3*



*Fig. 4*



*Witnesses:*  
 Frank D. Lewis  
 Dyer Smith

*Inventor:*  
 Leslie A. Brown  
 by Frank L. Brown  
 Atty.



# UNITED STATES PATENT OFFICE.

LESLIE A. BROWN, OF BEDFORD, INDIANA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO  
THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PHONOGRAPH.

1,036,440.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Application filed April 2, 1909. Serial No. 487,534.

*To all whom it may concern:*

Be it known that I, LESLIE A. BROWN, a citizen of the United States, and a resident of Bedford, in the county of Lawrence and

State of Indiana, have made a certain new and useful Invention in Phonographs, of which the following is a description.

This invention relates to phonographs of the type in which a traveling carriage carrying a reproducer stylus is fed axially past a rotating record cylinder, and the object of my invention is chiefly to provide efficient means whereby the phonograph may be started and stopped automatically.

In my preferred construction, the operating mechanism of the phonograph is stopped by the action of the traveling carriage in unlatching the end gate of the machine when the end of the record is reached, or at some other desired predetermined point, the machine being automatically started when the end gate is closed, which would in practice, of course, be after a new record has been inserted on the mandrel.

More broadly, my invention comprises efficient means for starting and stopping the operating mechanism of the phonograph without regard to the end gate.

My invention also comprises means for preventing slipping of the record when in place upon the mandrel.

Other objects are the provision of improved details of construction and combinations of elements as described and claimed in the following specification and claims.

Attention is hereby directed to the accompanying drawings, forming part of this specification, and in which—

Figure 1 represents a side elevation of a phonograph equipped with my invention; Fig. 2 is a plan view of one end of the phonograph showing my improved starting and stopping means; Fig. 3 is a detail view showing the tripping means carried by the traveling carriage; and Fig. 4 is a view of the rotating mandrel showing my improved anti-slipping device attached thereto.

The same reference characters will be used to denote corresponding parts in the various views.

Referring to the drawings, the standards 2 rising from the bed-plate 1 carry bearings for the rotating mandrel and other rotating parts. The rotating mandrel 3 carrying record 4 is mounted as by centers 5 in bear-

ing 6 at the left hand end of the machine as viewed in Fig. 1, and in bearing 7 carried by end gate 8 at the right hand end of the machine. End gate 8 is pivoted or hinged at 9 and carries the spring latch 10, which is adapted to latch the end gate in closed position, spring 10 carrying a lug 11, which is adapted to co-act with the top of post 12 formed on the end of straight edge 13. The end of spring 10 extends above the top of straight edge 13 into the path of the cam-shaped lug 14 carried by the arm 15 of traveling carriage 16 and riding on top of the straight edge 13. This cam 14 rides under the end of spring latch 10 when the reproducer stylus reaches the end of the record to lift the lug 11 of the latch out of contact with the top of post 12. Thereupon end gate 8 is immediately thrown open by a spring 17, which is coiled around the pivotal stud 9 of the end gate, one end of the same being secured to the end gate so that the said spring constantly tends to force the end gate to an open position.

The starting lever 18 has connected thereto the spiral spring 19, the other end of which is secured as by the screw 20 to the post 12. Also secured to the starting lever 18 is the rod or link 21, the opposite end of which extends through the hole or passageway 22 in the post 12, which guides the rod 21, the end of the said rod contacting the surface 23 of the end gate when the latter is latched in closed position. The rod 21 is of such a length that when the end gate is closed and the end of rod 21 is in contact therewith, as shown in Fig. 1 of the drawings, the starting lever 18 will be forced to its operating position, the motor then being allowed to rotate the mandrel and feed the traveling carriage axially of the same. Also, by this movement of the starting lever 18 to running position, the spring 19 will be put under tension. When the traveling carriage 16 reaches the end of the record, the lug 14 will trip the latch 10, whereupon the end gate will fly open, the rod 21 will slip through the passageway 22 in the post 12 and the spring 19 will draw the starting lever 18 to the right, stopping the machine. When a new record has been placed upon the mandrel, or when it is desired to again start the machine the end gate 8 will be closed, the surface 23 of the same forcing the rod 21 to the left, as shown



in Fig. 1 of the drawings, and again starting the motor.

My invention also comprises an anti-slipping device, as stated. This consists of a narrow strip of silk or other ribbon 24, which is secured firmly to the mandrel 3 longitudinally of the same as by means of small brass clamps 25 which are secured to the two ends of the mandrel as by screws. The provision of the silk or other friction surface on the metal mandrel prevents all possibility of the slipping of records while the machine is in operation.

It is, of course, obvious that various changes may be made in the details of my invention without departing from the spirit thereof; and I wish, therefore, not to be limited to the exact structure shown and described.

What I claim as new and desire to protect by Letters Patent of the United States is as follows:—

1. In a phonograph, the combination with the starting lever and the reproducer carriage, of a hinged gate, means for latching the gate closed, means for automatically opening the gate when the carriage reaches the end of the record, and connections for actuating the starting lever with the closing and opening of the gate, substantially as described.

2. In a phonograph, the combination with the starting lever and the reproducer carriage, of a hinged gate, means for latching the gate closed, means carried by the carriage for automatically opening the gate at a predetermined point in the travel of the carriage, and means connected with the starting lever for actuating the said lever in one direction or the other, operated by the closing and opening of said gate, substantially as described.

3. In a phonograph, the combination with the starting lever and the reproducer carriage, of a stationary member, a hinged gate and means for latching the same in closed position, a spring connecting the starting lever with the stationary member, a rod connected to the said lever and abutting the gate when closed, the rod being of such length as to force the lever to running position and tension the said spring when so abutting the gate, and means carried by the carriage for unlatching the gate, substantially as described.

4. In a phonograph, the combination with the reproducer carriage, of a hinged gate, means for latching the gate closed, means tending to open the gate, and means carried by the carriage for automatically releasing said latching means to permit said second named means to open the gate, substantially as described.

5. In a phonograph, the combination with the starting member and the reproducer carriage, of a stationary member, a stylus member, a hinged gate, means for latching the same in closed position, and means tending to open the same, yielding means connecting the starting member with the stationary member, a rod connected to said starting member, the said rod being movable by said gate to force the lever to running position and to tension said yielding means, and means carried by the carriage for unlatching the gate to permit the same to be opened by said second named means, substantially as described.

This specification signed and witnessed this 29th day of March, 1909.

LESLIE A. BROWN.

Witnesses:

F. T. SHERWOOD,  
N. E. CLARK.



H. H. DYKE.  
 PHONOGRAPH REPRODUCER.  
 APPLICATION FILED APR. 12, 1909.

1,036,469.

Patented Aug. 20, 1912.

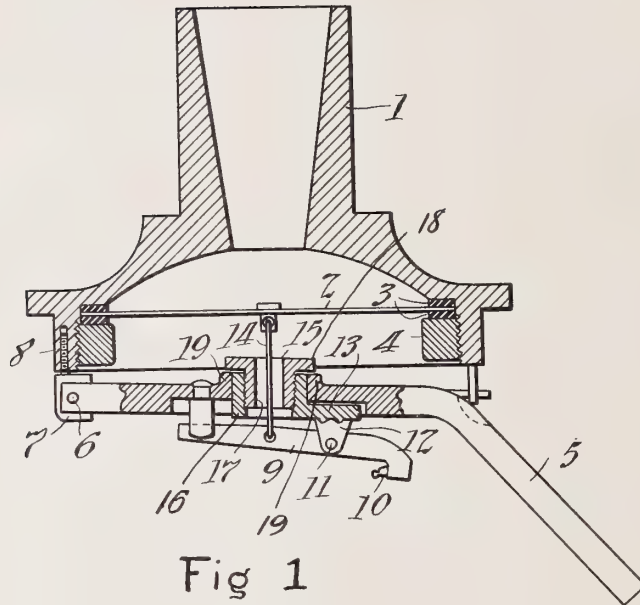


Fig 1

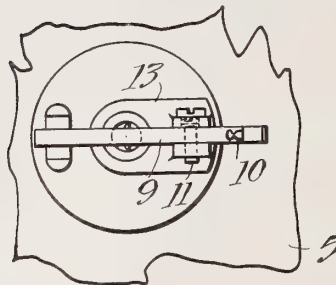


Fig 2.

*Witnesses:*  
 Frank D. Lewis  
 Dyke Smith

*Inventor:*  
 Herbert H. Dyke  
 by Frank L. Lewis  
 Atty.

# UNITED STATES PATENT OFFICE.

HERBERT H. DYKE, OF WEST ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH-REPRODUCER.

1,036,469.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Application filed April 12, 1909. Serial No. 489,467.

*To all whom it may concern:*

Be it known that I, HERBERT H. DYKE, a citizen of the United States, and a resident of West Orange, county of Essex, and State of New Jersey, have made a certain new and useful Improvement in Phonograph-Reproducers, of which the following is a description.

My invention relates to phonograph reproducers, and the particular object of my invention is to provide an improved mounting for the stylus lever, whereby the same may be permitted freely to travel in a direction transverse to the record groove tracked by the stylus.

My invention resides chiefly in an improved construction whereby this desirable freedom of movement can be attained, which construction will be disclosed in the following description and claimed in the appended claim.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar characters of reference indicate corresponding parts in the figures.

Figure 1 is a side elevation, partly in section, of a phonograph reproducer showing my invention; and Fig. 2 is a fragmentary bottom view of the same.

Referring to the drawings, the reproducer comprises a sound box body 1 of the usual form and a diaphragm 2 secured between gaskets 3 by a clamping ring 4 threaded in a depending flange of the body 1. The floating weight 5 is pivoted at 6 to the pivot block 7, which is pivoted to the body 1 by the usual screw 8. The stylus lever 9 carries the stylus 10, and the lever 9 is pivoted on the horizontal screw or stud 11, which is mounted in depending lugs 12. The lugs 12 have formed integral therewith or secured thereto an arm 13 which extends parallel to the under surface of the floating weight 5. The lever 9 is connected to the center of the diaphragm 2 by a link 14, as is usual. The link 14 passes through the passageway 15 in the floating weight 5. The arm 13 has formed integral therewith or secured thereto

a hollow stud or member 16 which is rotatably mounted in the floating weight. This stud forms the pivot about which the stud 11 and stylus 10 carried by the stylus lever are free to rotate in a direction transverse to the record groove. The arm 13 between the pivot 16 and the ears 12 provides a radius of such length that the stylus 10 in its movements transverse to the record groove will travel in an arc of considerable flatness, whereby greater freedom and a more universal movement of the stylus lever are attained. At the same time the pivot 11, about which the stylus lever oscillates in following the vertical movement of the stylus in tracking the record groove, is placed sufficiently near the stylus end of the lever 9, so that the lever arm of the link 14 will be sufficiently greater than the lever arm of the stylus 10 to provide for proper amplification of the vertical movements of the stylus.

The stud 16 is formed with a vertical longitudinal passageway therethrough, through which the link 14 extends. By placing the stud 16 in the axis of the link 14 and making the same hollow, the necessity of drilling a second hole or recess in the floating weight 5 is eliminated. The hollow stud 16 may be mounted in the floating weight in any suitable way to provide for the easy rotation of the stud. As shown in the drawings, the stud 16 is formed with a screw thread on its bore, which engages with a screw thread on the periphery of a thimble 17, which is formed at the upper end thereof with an annular flange 18 which rests upon a boss 19 on the upper surface of the floating weight 5.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

In a phonograph reproducer, the combination with a diaphragm, of a floating weight having a central aperture therethrough in line with the center of said diaphragm, a stud having a central aperture therethrough mounted to rotate freely in said aperture, a hollow cylindrical member mounted within said stud and secured there-



to, said member having a flange upon its upper end bearing upon the upper surface of said weight, said stud having an arm upon its lower end at right angles to its axis, a pivot pin parallel to said diaphragm carried by said arm, a stylus lever pivoted upon said pin, and a connection between said lever and diaphragm passing through the apertured stud and hollow member, substantially as described. 10

This specification signed and witnessed this 10th day of April 1909.

HERBERT H. DYKE.

Witnesses:  
DYER SMITH,  
JOHN M. CANFIELD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

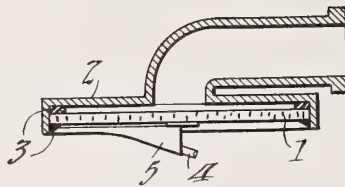


T. A. EDISON.  
PHONOGRAPHIC APPARATUS.  
APPLICATION FILED NOV. 3, 1909.

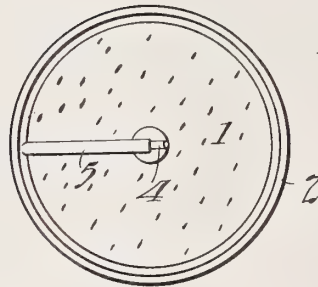
1,036,470.

Patented Aug. 20, 1912.

*Fig. 1*



*Fig. 2*



*Witnesses:*  
*Frank D. Lewis*  
*Dyer Smith*

*Inventor:*  
*Thomas A. Edison*  
*by Frank L. Dyer*  
*Attys.*

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, WEST ORANGE, NEW JERSEY, ASSIGNOR  
TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A COR-  
PORATION OF NEW JERSEY.

## PHONOGRAPHIC APPARATUS.

1,036,470.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Application filed November 3, 1909. Serial No. 526,036.

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, West Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographic Apparatus, of which the following is a description.

My invention relates to phonographic apparatus, and the object thereof is to provide a diaphragm adapted to be used in a sound recorder or reproducer, but particularly in the former, and having such qualities as to cause it to vibrate truly in accordance with the sound waves to be recorded or reproduced, when mounted in a suitable sound recorder or reproducer.

My invention also consists in a sound recorder or reproducer having such a diaphragm as an element thereof.

It has heretofore been proposed to manufacture diaphragms from a large number of substances, among which copper and other metals, glass, mica, felt, fiber, paper stock and thin wood may be mentioned. None of these substances possesses all the attributes necessary for the perfect diaphragm. In the case of diaphragms made from substances which do not occur in nature in such a form that they can be directly used for the purpose, as metals, glass, etc., internal and local stresses are bound to occur, so that the thin elastic disk constituting the diaphragm necessarily has an uneven and buckled surface, each minute buckle or portion of different tension vibrating independently when the disk is vibrated as a diaphragm resulting in the production of foreign noises. In the case of mica, the structure is such that the best results can not be obtained. In the case of wood, birch bark, etc., the grain and natural formation of the same render them unable to vibrate in perfect accordance with the sound waves to be recorded or reproduced.

I overcome the difficulties above noted by the use of cork as a diaphragm material. Cork is a substance which is absolutely free from internal stresses or distortions, and which is not striated or foliated, or otherwise rendered uneven in its structure. Preferably, the diaphragm is cut from a section of the bark taken at right angles to the di-

ameter of the tree, so that the small holes or pits which are found in cork, and which extend radially outward when the bark is in position on the tree, will extend transversely of the diaphragm. A cork may be obtained in which these openings are very fine and slight, and this material should be used for the manufacture of diaphragms. If diaphragms are made from cork of poorer quality, in this respect, having a number of holes or air passages extending there-through, the proper operation of the diaphragm will be interfered with. The diaphragm should be sufficiently thick to have the requisite firmness. I have obtained the best results with a diaphragm having a thickness of at least one-sixteenth of an inch.

Reference is hereby made to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a central vertical section through a phonograph recorder embodying my invention. Fig. 2 is a bottom plan view thereof.

In the drawings, the diaphragm 1 is mounted in the sound box 2 between gaskets 3 or in any other well known manner. The recording stylus 4 is mounted in a holder 5 which is attached to the center of diaphragm 1 in a well known manner.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

In apparatus of the class described, the combination with a phonographic sound box, of a cork diaphragm mounted therein and firmly secured thereto adjacent its periphery, a stylus, and means for connecting said stylus to said diaphragm, said diaphragm being free from large pits or openings, being cut on a section substantially at right angles to the direction of the pits therein, and having sufficient thickness to be firm and substantially free from air passages therethrough, substantially as described.

This specification signed and witnessed this 1st day of November 1909.

THOS. A. EDISON.

Witnesses:

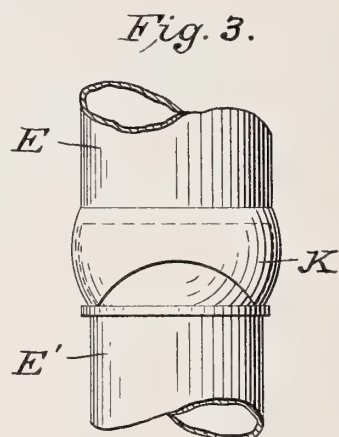
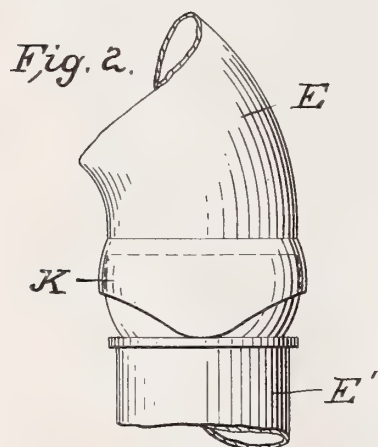
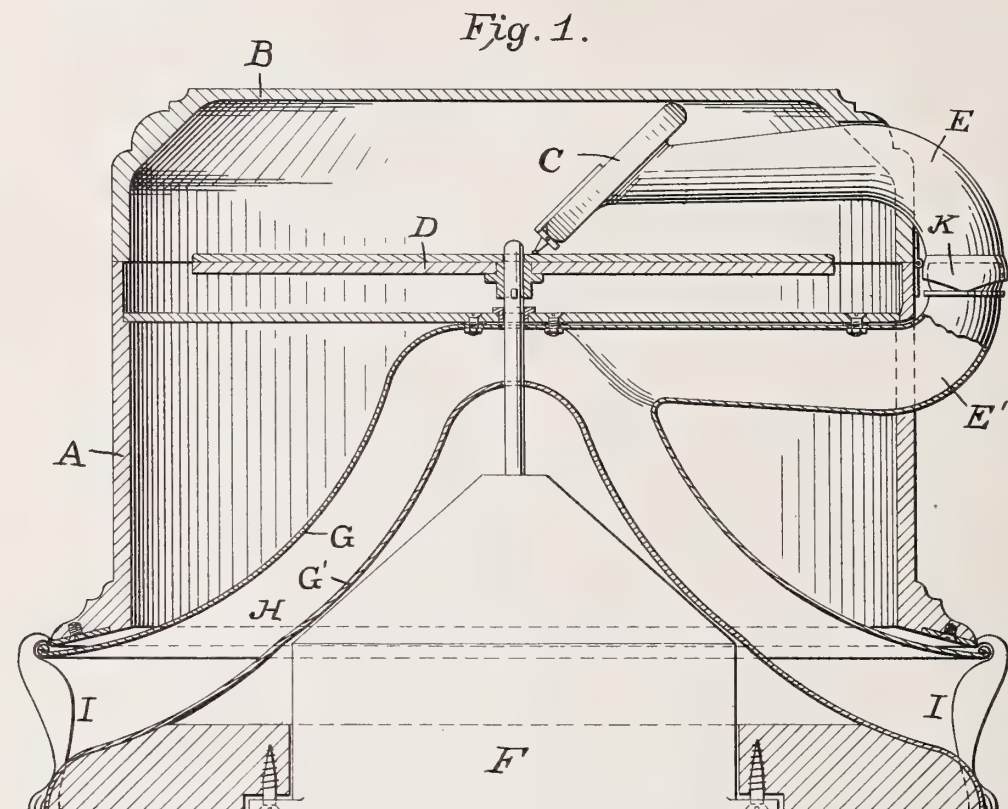
DYER SMITH,  
JOHN M. CANFIELD.







J. M. EVANS.  
 AMPLIFIER FOR TALKING MACHINES.  
 APPLICATION FILED FEB. 25, 1911. RENEWED JAN. 16, 1912.  
 1,036,474. Patented Aug. 20, 1912.



*Attest:*  
*Edw. L. Tolson,*  
*E. W. Middleton.*

*Inventor:*  
*James M. Evans,*  
*by Spear, Middleton, Donaldson & Spear*  
*Attys.*

# UNITED STATES PATENT OFFICE.

JAMES M. EVANS, OF WESTPORT, CONNECTICUT.

## AMPLIFIER FOR TALKING-MACHINES.

1,036,474.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Application filed February 25, 1911, Serial No. 610,882. Renewed January 16, 1912. Serial No. 671,531.

*To all whom it may concern:*

Be it known that I, JAMES M. EVANS, citizen of the United States, residing at Westport, Connecticut, have invented certain new and useful Improvements in Amplifiers for Talking-Machines, of which the following is a specification.

My said invention relates mainly to amplifiers of sound reproducing or talking machines, its object being to deliver the amplified sound waves with uniform and equal distribution and without interference or distortion, into the surrounding atmosphere. The form of amplifier which I have devised for these purposes also is well adapted to a form of musical instrument at once compact and convenient, and susceptible of ornamentation.

It is illustrated in the accompanying drawings, in which,

Figure 1 shows a central vertical section of the instrument; and Figs. 2 and 3 elevations of details.

In Fig. 1 at A is indicated the wall of a cylindrical case, which incloses the main part of the apparatus. In its upper part is shown the turn-table D, mounted on its vertical shaft, which is rotated by any suitable motor, located in the space F, within the inner shell of the amplifier. The case has a cover B, and beneath it is shown the ordinary sound box C, on the end of a tone arm made in two parts, E and E', swiveled at K. The lower fixed part is connected with the apex of the amplifier as shown in Fig. 1. This tone arm, as usual, may act to some extent as an amplifier, but my amplifier proper is shown distinct therefrom. This consists of two approximately bell shaped shells corresponding to each other in shape and arrangement, and located, one within the other, whereby they form a corresponding sound amplifying space, throughout the whole extent of the amplifier from inlet to exit, and exclusively controlling the sound waves in the space between the walls to their final discharge into the atmosphere. Further, this sound amplifying space (of corresponding approximately bell shape) increases toward the exit in two dimensions; first in thickness, that is to say, in distance between the walls, and also in general diameter, or across the bell. The outer shell is supported on a horizontal wall

or bar in the case, and the inner (not relied upon for vibration) rests, at its outer edge, on the annular base of the casing. By reason of this continually expanding space between walls which correspond in shape and position, from inlet to outlet of the vibrating air therein, the interference and distortion of sound waves are diminished and the tone improved.

This construction admits, as shown in Fig. 1, of a lateral discharge at all points and equally into the atmosphere. It also admits of a shorter or lower instrument, without protruding horn. It also, in the construction and organization of the apparatus, locates the sound producing devices at the inlet end of the amplifier, and leaves the discharge end unobstructed without sacrifice of compactness. This construction also (as it includes the motor within the jacketed space of the bells) deadens the sound of the motor, as well as conceals it, in space otherwise unused.

Figs. 2 and 3 show more clearly the swiveled joint of the tone arm.

I claim:

1. In a talking machine, an amplifier composed of two flaring shells or walls, one within the other, providing a space between the inner faces of the walls extending throughout the length of the amplifier, said walls being arranged in relation to each other to act upon the sound waves throughout the entire length of the amplifier and to discharge them circumferentially into the atmosphere in combination with the sound producing device in communication with the inlet end of the amplifier.
2. In a talking machine, an amplifier comprising a double walled horn providing a sound space between the walls, a tone arm connected directly to the double walled portion at the inlet end of the amplifier, the discharge end of the walls being open for the emission of the sound waves circumferentially of the amplifier, substantially as described.
3. In combination with a cabinet, an amplifier located therein having double walls and of bell shape, the upper end of the amplifier being arranged substantially centrally of the cabinet, and the lower end of the bell extending peripherally around the base and opening into the room, and a tone



arm directly connected to the double walled portion of the amplifier at the inlet end, substantially as described.

4. In a talking machine, a cabinet, a double walled amplifier arranged within the cabinet and intermediate of the top and bottom thereof, driving means located beneath the lower wall of the amplifier whereby its sound is muffled, an axial shaft therefrom

and a turn table thereon above said amplifier, and a tone arm connected to the amplifier, substantially as described. 10

In testimony whereof, I affix my signature in presence of two witnesses.

JAMES M. EVANS.

Witnesses:

F. L. MIDDLETON,  
EDWIN S. CLARKSON.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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P. J. HENRY.  
TALKING MACHINE ATTACHMENT.  
APPLICATION FILED OCT. 18, 1911.

1,036,492.

Patented Aug. 20, 1912.

Fig 1

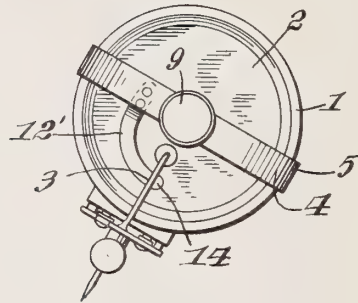


Fig 2

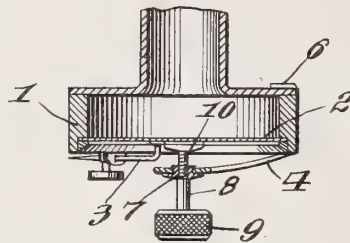


Fig 3

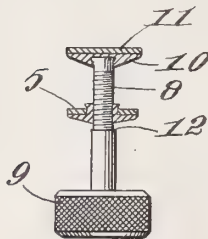
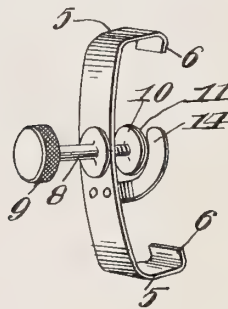


Fig 4



Witnesses

*M. H. Lifer*

*C. C. Hines.*

Inventor

*Peyton J. Henry*

By *Victor J. Evans*

Attorney

# UNITED STATES PATENT OFFICE.

PEYTON J. HENRY, OF CHARLOTTE, NORTH CAROLINA.

## TALKING-MACHINE ATTACHMENT.

1,036,492.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Application filed October 18, 1911. Serial No. 655,261.

*To all whom it may concern:*

Be it known that I, PEYTON J. HENRY, a citizen of the United States, residing at Charlotte, in the county of Mecklenburg and State of North Carolina, have invented new and useful Improvements in Talking-Machine Attachments, of which the following is a specification.

This invention relates to an attachment for talking machines, the object of the invention being to provide a damper and modulator of simple, cheap and efficient construction, which may be readily attached to the sound-box of a machine for dampening and regulating the sound-producing mechanism at will and eliminating the harshness and squeakiness of the sounds sometimes produced and at the same time rendering the enunciation of the sound-producing mechanism clearer and more distinct.

A further object of the invention is to provide a device of this character which may be employed for governing the vibrations of the diaphragm and stylus-arm to a greater or less extent without injury thereto, which may be thrown out of operation without removal from the sound-box when desired, and which may be attached to and detached from the sound-box in a ready and convenient manner.

The invention consists of the features of construction, combination and arrangement of parts hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 is a front elevation of the sound-box of a talking machine with my device attached thereto. Fig. 2 is a sectional plan view of the same. Fig. 3 is a detail section through the bracket and damper and showing the adjusting screw. Fig. 4 is a perspective view of the device detached.

Referring to the drawings, 1 designates the sound-box of a graphophone or similar talking instrument; 2 the vibrating diaphragm or disk thereof; and 3 the stylus-carrying arm which communicates vibratory motion to the disk.

The attachment comprises a longitudinally bowed bracket 4, formed of a strip of spring metal, and which is provided with rearwardly projecting jaws 5 to embrace the opposite sides of the sound-box and inwardly projecting fingers 6 to engage the rear of the sound-box, whereby the bracket

is clamped in position. The bracket is adapted to extend transversely across the front of the sound-box and may be applied and detached by a transverse sliding movement, as will be readily understood. The central portion of the body of the bracket has fixed thereto an internally threaded bearing 7 through which passes an adjusting screw 8 having at its outer end a milled head or finger piece 9. The inner end of the screw carries a damper 10, swiveled to the screw and provided with a layer 11 of felt or other suitable soft material. By means of the screw the damper may be adjusted inwardly to bear with greater or less pressure upon the diaphragm, to regulate its degree of vibration to any desired extent. A stop shoulder 12 is provided on the screw to engage the bracket, whereby inward movement of the screw is limited, so that the damper cannot be adjusted to bear to an injurious extent against the diaphragm. The swivel connection between the screw and damper permits the screw to be turned independently of the damper when the latter contacts with the diaphragm, thus preventing rotary motion of the damper and consequent injury to the diaphragm. A dampening arm or projection 12' is carried by the body portion of the bracket and has its inner end 14 arranged to project between the diaphragm and stylus-arm when the bracket is applied in position. This dampening arm is adjustable into engagement with the stylus-carrying arm when the damper is adjusted into engagement with the disk, through the outward bowing of the body of the bracket under the resistance set up by the diaphragm, whereby the extent of vibration of the stylus-arm may also be varied to the desired degree. It will thus be seen that the amplitude of the vibrations of both the diaphragm and the stylus-arm may be simultaneously regulated, and the sound-producing mechanism thus dampened or modulated to vary the volume of sound of the instrument as occasion or fancy may require, whereby the harshness and squeakiness of tone sometimes produced may be eliminated or reduced to a material extent and the sound modulated to regulate the tone. The instrument may also thus be controlled to regulate the enunciation and increase the distinctness of talking tones.

The device may be readily and conven-



iently applied to and removed from the sound-boxes of talking instruments of the character described, is simple and inexpensive in construction, and is adapted to efficiently perform the desired functions.

Having thus described the invention, what I claim as new is:

The combination with a sound-box and its diaphragm, of a stylus-arm, a modulator comprising a bracket adapted to terminally engage the sound-box and extend diametrically thereof, said bracket being provided with a threaded bearing, an adjusting screw engaging said threaded bearing, a damper swiveled to the screw and adapted to engage the diaphragm, said damper being

provided with a contact surface of soft material, and an angularly bent resilient damper arm secured at one end to the bracket and having its free end arranged at an angle thereto and parallel with the surface of the diaphragm, said arm being adapted to engage the stylus-arm and to be adjusted with the dampening device by means of the screw to vary its dampening pressure.

In testimony whereof I affix my signature in presence of two witnesses.

PEYTON J. HENRY.

Witnesses:

J. P. GARRISON,  
W. R. HENRY.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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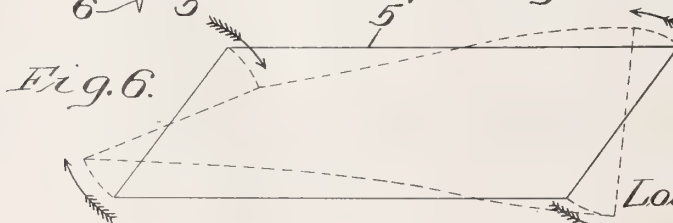
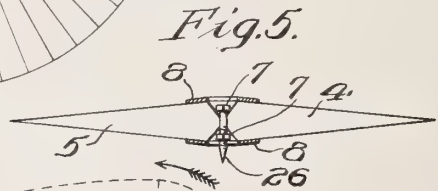
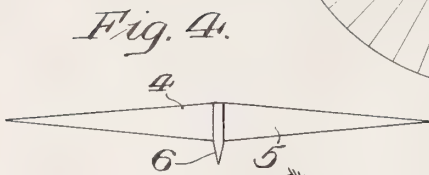
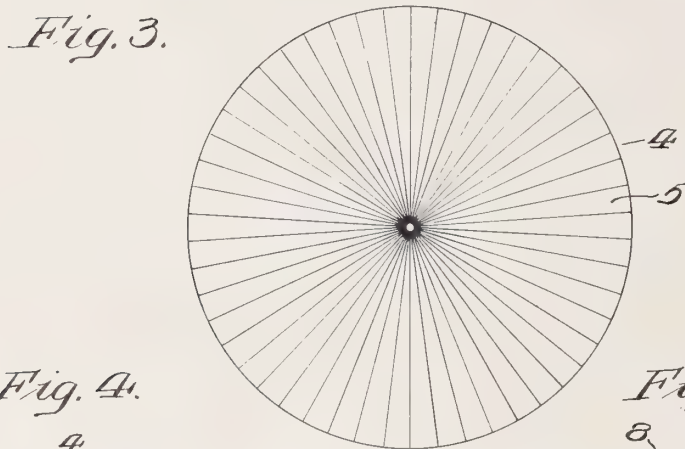
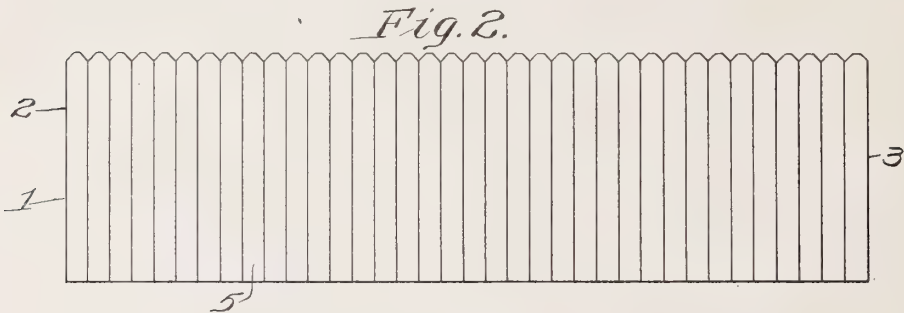
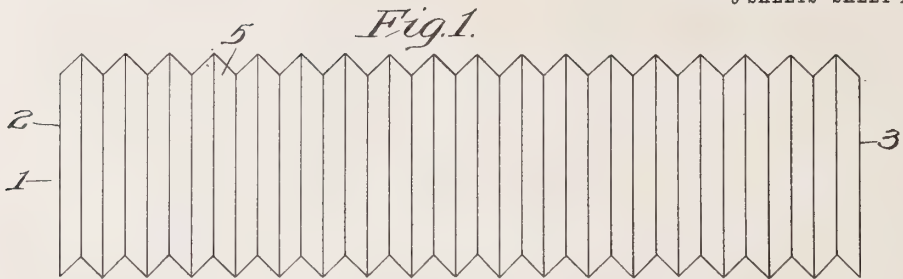


L. LUMIERE.  
ACOUSTICAL INSTRUMENT.  
APPLICATION FILED MAR. 26, 1910.

1,036,529.

Patented Aug. 20, 1912.

5 SHEETS—SHEET 1.



WITNESSES

*H. G. Hartman.*  
*J. Henderson.*

BY

*Horace Bell*

INVENTOR

*Louis Lumiere.*

ATTORNEY



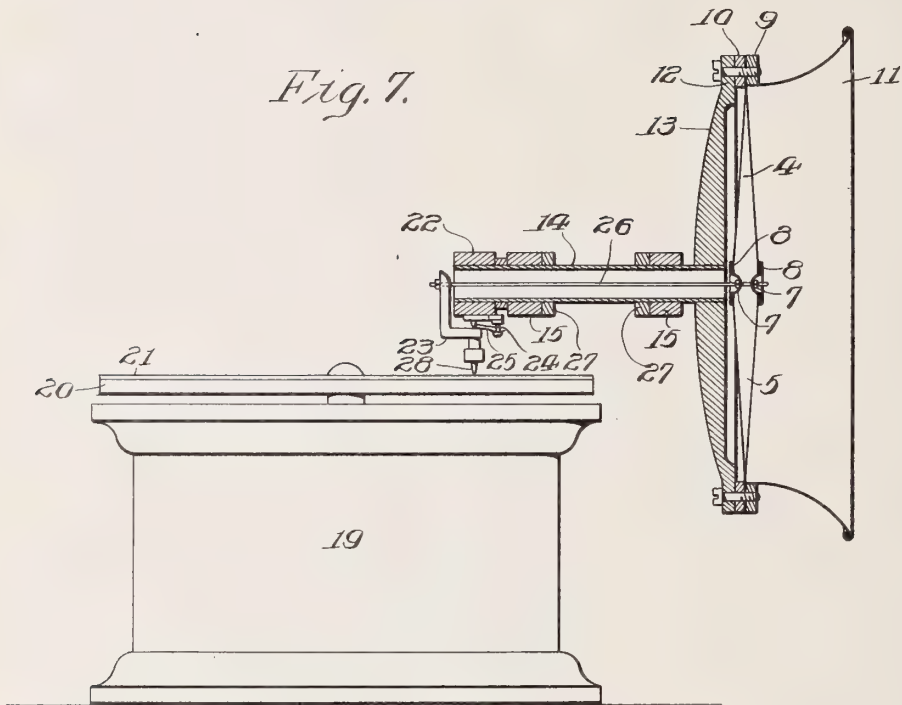


L. LUMIERE.  
ACOUSTICAL INSTRUMENT.  
\*APPLICATION FILED MAR. 26, 1910.

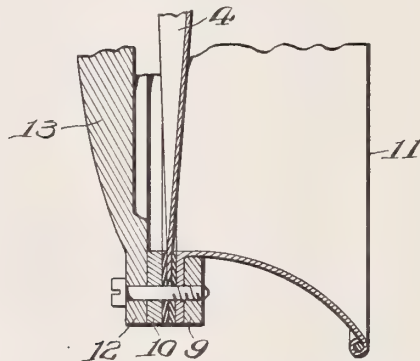
1,036,529.

Patented Aug. 20, 1912.  
5 SHEETS—SHEET 2.

*Fig. 7.*



*Fig. 7, a*



WITNESSES  
*Chas. J. Hartman*  
*J. Henderson*

INVENTOR  
*Louis Lumiere.*  
BY *Horace Bell*  
ATTORNEY

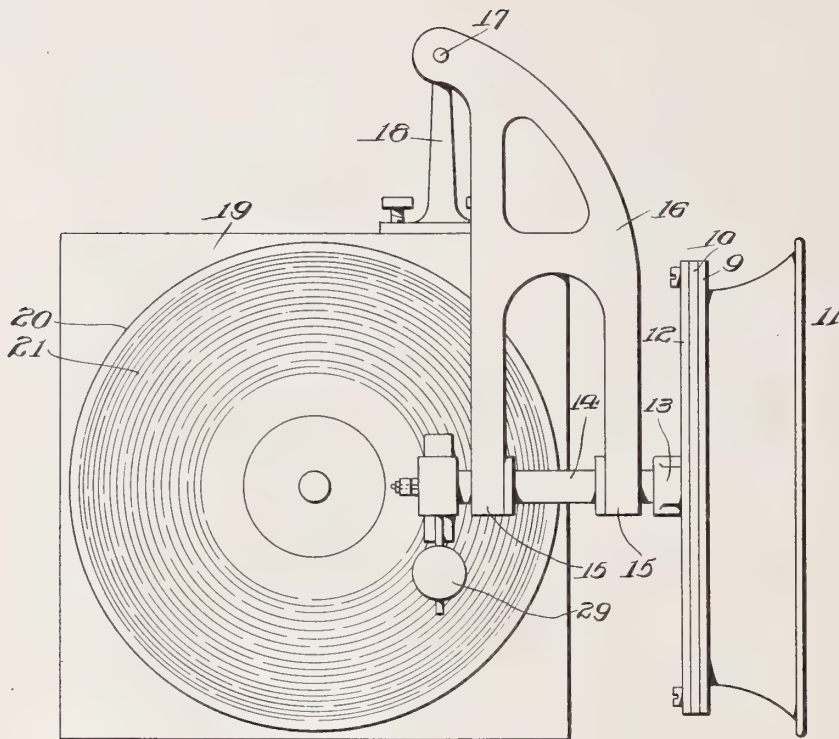


L. LUMIERE.  
ACOUSTICAL INSTRUMENT.  
APPLICATION FILED MAR. 26, 1910.

1,036,529.

Patented Aug. 20, 1912.  
5 SHEETS—SHEET 3.

*Fig. 8.*



WITNESSES

*W. J. Hartman.*  
*J. Henderson*

INVENTOR

*Louis Lumiere.*

BY

*Tracey*

ATTORNEY





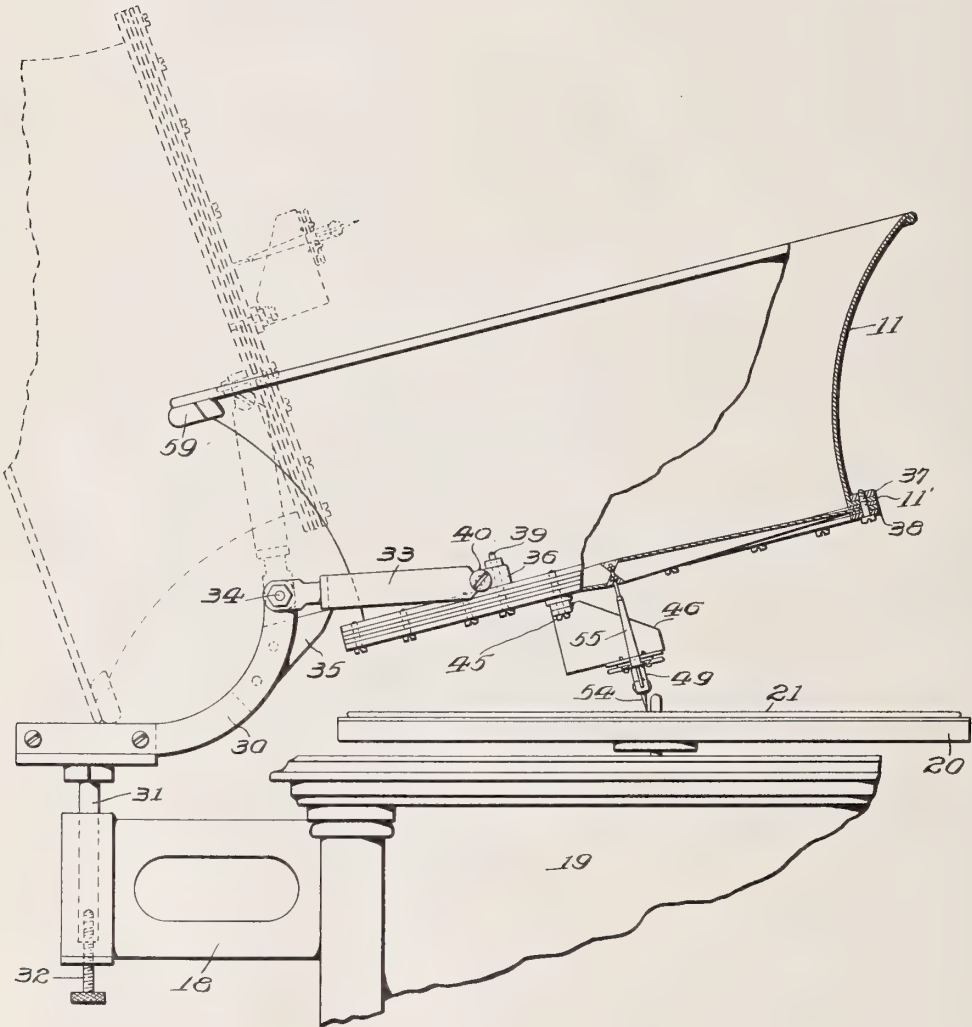
L. LUMIERE.  
ACOUSTICAL INSTRUMENT.  
APPLICATION FILED MAR. 26, 1910.

1,036,529.

Patented Aug. 20, 1912.

5 SHEETS—SHEET 4.

*Fig. 9.*



INVENTOR

*Louis Lumiere.*

WITNESSES

*H. G. Hartmann.*  
*J. Henderson.*

BY

*Horace G. Bell*

ATTORNEY





# UNITED STATES PATENT OFFICE.

LOUIS LUMIERE, OF LYON, FRANCE, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, OF CAMDEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## ACOUSTICAL INSTRUMENT.

1,036,529.

Specification of Letters Patent.

Patented Aug. 20, 1912.

Original application filed June 30, 1909, Serial No. 505,149. Divided and this application filed March 26, 1910. Serial No. 551,638.

*To all whom it may concern:*

Be it known that I, LOUIS LUMIERE, a citizen of the Republic of France, residing at Lyon, in the Republic of France, have  
5 invented certain new and useful Improvements in Acoustical Instruments, of which the following is a full, clear, and complete disclosure.

This invention relates to improvements in  
10 acoustical instruments, such as telephones, microphones, sound recording and reproducing machines, and musical instruments in general, and the present application is a division of an application filed by me June  
15 30, 1909, Serial Number 505,149.

As applied to sound recording and reproducing apparatus, my invention relates more particularly to that part of the instrument which is generally known as the diaphragm,  
20 or the body which in the process of sound recording is thrown into vibration by the sound waves, and the vibrations of which are traced and recorded by means of a stylus in the original record, while in the process  
25 of reproduction the diaphragm, (as a general rule, the diaphragm of a separate machine) is thrown into corresponding vibrations by a stylus to which it is attached, being made to follow the undulations in the record.

30 My invention also relates to the sound box in which said diaphragm is mounted.

The object of my invention is to provide a diaphragm and a mounting therefor, by means of which sounds may be faithfully  
35 recorded and reproduced, which will be sensitive to sound waves and by the use of which the reproduction of sound will be improved and amplified.

Further objects of my invention are to  
40 increase the reproducing surface of a diaphragm, and, at the same time, to place the entire surface under a tension, (preferably torsional), to make it sensitive; to increase the active surface of a diaphragm of a certain given diameter; to increase the diam-  
45 eter of the diaphragm without making it liable to vibrate in parts, or to set up nodes or inactive portions in the diaphragm, or, in other words, to substantially increase the  
50 size of the diaphragm and, at the same time, have it vibrate throughout; to construct a diaphragm having a plurality of sound re-

sponsive elements, each of which is subjected to a molecular tension, and to subject each of a plurality of sound responsive  
55 elements to a molecular tension to increase the sensitiveness thereof and to cause them to vibrate as a whole.

Further objects of my invention will be found in the specification and claims below. 60

The invention consists in a diaphragm for acoustical instruments, having one or more freely resilient, sound responsive surfaces or elements, which have been brought into a condition of molecular stress, of an aggregate  
65 superficial area substantially larger than the surface of a plane disk of the same diameter, and in a recorder or reproducer in which said diaphragm is mounted.

It is found that the effect of bringing the  
70 surfaces of a vibrating body into a condition of molecular stress by torsion, is to reduce to a minimum the tendency of the vibrating body to form nodes during operation, so that the surface or surfaces of the  
75 diaphragm will vibrate as a whole and will not produce the disagreeable effect which is technically known as blasting or shattering.

One construction of diaphragm made according to this invention and the method  
80 of making it is illustrated in the accompanying drawings, in which:—

Figure 1 shows a folded strip of material from which the improved diaphragm may be made; Fig. 2 is a plan view of a modified  
85 form of folded strip of material from which a diaphragm may be made; Fig. 3 is a plan view of the diaphragm; Fig. 4 is a sectional elevation of the diaphragm; Fig. 5 is a sectional elevational view of a slightly  
90 modified form of diaphragm; Fig. 6 is a diagram to illustrate the way in which the surfaces or elements of the diaphragm are twisted; Fig. 7 is an elevation of a sound  
reproducing machine fitted with the dia- 95  
phragm made in accordance with this invention and illustrates a convenient method of carrying the diaphragm and connecting it to the stylus bar; and Fig. 7<sup>a</sup> is a sectional detail portion of Fig. 7. Fig. 8 is a plan  
100 view of the machine shown in Fig. 7; Fig. 9 is a side elevational view partly in section of a modified form of sound reproducing machine provided with my invention. Fig.



10 is an enlarged view, partly in section, of the diaphragm and stylus bar mounting shown in Fig. 9; and Fig. 11 is a bottom plan view of the reproducer shown in Fig. 9.

5 According to one method of carrying out this invention, a diaphragm is constructed so that it represents the form shown in Figs. 1, 3 and 4 of the accompanying drawings, in which the whole surface of the diaphragm  
10 on either side consists of a plurality of elements reversely flexed to form a fan-like series of radially disposed ridges and furrows, the ridges on one side of the diaphragm corresponding to the furrows on the other side  
15 of the diaphragm, and the furrows gradually widening out and becoming less deep as they approach the edge of the diaphragm until at its perimeter the diaphragm lies in one plane. The elements forming the sides  
20 of the ridges and furrows provide the desired freely resilient sound responsive surfaces. A diaphragm of this form may be obtained by folding or plaiting a substantially rectangular strip of paper 1, or other  
25 suitable material in the manner shown in Fig. 1. The length of the strip of material before folding should be substantially the length of the circumference of the diaphragm to be formed therefrom, and the  
30 width of the strip should be substantially equal to the radius of the said diaphragm. When the strip has been plaited or folded in the manner above described and shown, the ends 2 and 3 should be brought together  
35 and secured to each other in any suitable manner. At this stage of the process or method, the strip will present, roughly speaking, the appearance of a cylinder having fluted sides. This strip of material is  
40 then pressed down and forced to assume the form shown in Figs. 3 and 4, one edge of the strip being crimped together at the center, and the other edge forming the perimeter; the radial ridges and furrows, or plaits being  
45 closest together and of greatest depth at the center, and gradually opening out and flattening toward the edge where the diaphragm may be held in one plane between clamping rings, as shown in Figs. 7 to 11.  
50 In Fig. 3 the diaphragm is designated as 4 and the elements forming the plaits or ridges and furrows are designated by the numeral 5. The diaphragm 4 thus formed in the manner above described will be seen  
55 to have a surface formed wholly of a multiplicity of flexed sound responsive elements, reversely sloped or angled to each other, forming dihedral ridges. The surface of the diaphragm will consist of a surface comprising  
60 salient radial angled surfaces, and radial reëntrant angled surfaces. Any sector of the surface will have a fan-like formation. To the center of the diaphragm, is attached, in any suitable manner, the recording or reproducing stylus 6, as the case

may be. As shown in Fig. 4, the diaphragm is for use with or for a record having an up and down, or vertical cut, since the diaphragm is directly provided with a stylus at its center. For making the attachment between the stylus and diaphragm, or between the connection between the stylus and the diaphragm, I prefer to bevel off the inner edge of the diaphragm as particularly shown in Figs. 2, 9 and 10.  
75 The stylus 6 may be secured directly to the inner edges of the elements of the diaphragm by being cemented or glued thereto in the manner shown in Fig. 4, or it may be secured in place by means of nuts 7, as will be more particularly described below, in connection with the form of apparatus shown in Figs. 5, 9 and 10. The stylus 6 may also be surrounded by rings of stiff paper 8, secured on either side of the diaphragm at the center thereof to give it additional rigidity at that point. I do not, however, limit myself to this form of connection. The effect of constructing the diaphragm in this manner, is that the whole diaphragm, *i. e.*, the surface of each element of each ridge and furrow is under molecular stress, produced by torsion, but the sides of the ridges and furrows are twisted out of the plane in which they lie at the center of the diaphragm into a plane, practically at right angles thereto, at the circumference of the diaphragm. I have further found that in a diaphragm produced by this means, the tendency of the vibrating body to form nodes during operation is reduced to a minimum. The surface of each of the elements composing this diaphragm being helicoidal, and since each point in the vibrating body, as it moves, follows a direction normal to the tangential plane at this point, the result is that the direction of movement is different for each point that has to be considered so that the formation of nodes is practically impossible. It is obvious, of course, that the same condition of molecular stress would be produced upon twisting a sheet of material which naturally possessed a helicoidal, or other than plane, form so as to take up a position in a true plane, or other helicoidal form of different pitch.  
115

The diagram shown in Fig. 6, illustrates clearly the torsion which is applied to each of the multiple surfaces or elements of the diaphragm when the strip of material is made to take up the form shown in Figs. 3 and 4 from the form shown in Fig. 1. In this diagram 5' represents a thin flat sheet of elastic material, such as is formed by each of the several folds or plaitings of the strip shown in Figs. 1 and 2. If the two ends of this sheet are turned in opposite directions, as indicated by the arrows, and is made to take up the position shown in dotted lines, it is found that a very resilient body is  
130

formed, which is capable of vibrating more readily, and is more sensitive, *i. e.*, more sound responsive in its new position than it was before. This is probably due to the molecular stress which is imparted to it by this twisting action.

It will be clear that each of the surfaces or folds 5, of the diaphragm illustrated in Figs. 3 and 4 is in the same condition of molecular stress, as the sheet 5' in Fig. 6.

The width of the folds 5, relative to the breadth of the strip in which they are made, may vary; but I have found a convenient proportion to adopt when making the diaphragm of paper is about 10 to 1, so that each fold of the strip is 10 times as long as wide.

I have found that in a diaphragm having multiple resilient surfaces such as that above described, a greatly improved reproduction can be obtained. Moreover, a diaphragm constructed in the manner above described can be usefully made of considerably greater diameter than has heretofore been possible. Experience has seemed to prove that a plane diaphragm of mica, or other material, such as is used at the present day, if made of more than about three-and-a-half inches in diameter, loses in quality of reproduction, the reproduction becoming less musical and there being a liability to what there is technically known as "shattering," due probably to the diaphragm not vibrating as a whole, *i. e.*, to the setting up of nodes in the diaphragm. I have found, however, that I am able to make a diaphragm according to the present invention, as large as ten inches or more in diameter, without impairing the quality of the reproduction, and by means of this diaphragm, I at the same time, attain a much greater volume of sound than with the smaller diaphragm. This amplification of the sound, I believe to be due, not only to the increased diameter of the diaphragm, but also to the increased surface area of the diaphragm produced in the construction above described, by the platings or crimpings or folds in the material of the diaphragm; this appears to have the effect of putting into motion a greater volume of air and so increasing the volume of sound.

A diaphragm having freely resilient sound responsive surfaces brought into a condition of molecular stress, preferably by torsion, and also of an aggregate area substantially larger than a plane disk of the same diameter may of course be produced in other ways than that above described. I have found, however, that the above described method is a convenient one for making the diaphragm.

The advantage arising from the use of a diaphragm constructed as above described, is that the volume of sound produced is suffi-

cient to enable me to dispense with the usual amplifying horn, and in this way, much of the metallic and hollow character usually associated with talking machine reproductions is eliminated.

Diaphragms may be made according to this invention, of any suitable elastic material, such as paper, (which may be varnished if desired), card, celluloid, metal, or the like, and the surface, or surfaces, of the diaphragm, or elements composing the vibrating body, may be put under tension by any suitable means.

One means of mounting the stylus bar and diaphragm in an operative position particularly for use with a record having a record of sound in the form of a groove having lateral undulations in the walls thereof is shown in Figs. 7 and 8. In this case, the diaphragm 4 is held at the edges by clamping rings 9 and 10, and, to the front ring 9, may be secured a small trumpet 11 for directing the sound waves. The clamping ring 10 is fixed to a suitable backing ring 12, having radial arms 13 by which the same is carried by a tube 14 which is capable of turning freely in the bearings 15—15, of the swinging arm 16, pivoted at 17 upon a rigid bracket 18, fixed to the cabinet 19. The cabinet 19 is provided with a suitable mechanism for rotating the turntable 20 upon which a record 21 is carried in the usual manner. The tube 14 is provided at one end with a mounting 22 freely rotatable upon said tube 14, but prevented in any suitable manner, from longitudinal movement upon the tube 14. This mounting 22 carries a stylus bar 23 which may be mounted thereon in any suitable manner, as by being pivoted on the knife edges 24, and retained on said knife edge bearings by a spring 25, in the usual manner. The upper end of the stylus bar 23 is connected by a rod 26 with the diaphragm 5, the rod 26 being connected or attached to the diaphragm by nuts 7 in the manner shown in Fig. 5. In this construction as shown in Figs. 7 and 8, the diaphragm is preferably made from a sheet of material such as is shown in Fig. 2 of the drawings so as to provide a suitable recess on each side of the diaphragm, in which the nuts 7 are seated. These nuts may be further cemented or otherwise secured to the diaphragm. In the said figures the diaphragm is also shown as being provided with a stiffening ring 8 at the center of the diaphragm and surrounding the stylus bar connection 26. Suitable nuts or collars 27 may be employed for holding the tube 14 from lengthwise movement in the bearings 15.

As the stylus 28 follows the record groove, the arm 16 will swing across the record on the pivot 17, and the mounting 22, carrying the stylus bar 23, will oscillate around the



tube 14 with any unevenness in the rotation of the record. A suitable weight 29 may be attached to the mounting 22, to cause the stylus to engage the record with the requisite amount of pressure.

In Figs. 9, 10 and 11, I have illustrated a further modification of the way in which my diaphragm may be used in connection with a sound reproducing machine. In said figures, the record 21 is supported upon and rotated by a turn-table 20 driven by any suitable motor within the casing 19, and the cabinet is provided with a bracket 18 similar to the arrangement above described in connection with Figs. 7 and 8. An arm 30 is mounted upon a stem or pintle 31 to swing on said bracket in a plane substantially parallel with the plane of the record 21. The bracket 18 may be provided with a vertically adjustable stop 32 for the end of the stem 31, which, in the form illustrated in Fig. 9, consists of a screw threaded into the bracket 18, and against which the end of the stem or pintle 31 rests. By this means, the arm 30 may be raised or lowered to adjust the parts carried thereby with respect to the record 21 on the turn-table 20, to set the stylus at the proper angle to the record surface. The free end of the arm 30 carries a yoke 33 pivoted to the said arm by a bolt or pin 34, so as to be capable of swinging in a plane substantially perpendicular to the plane of the record. The said arm 30 is provided with a stop 35, which prevents the yoke from swinging downwardly beyond a predetermined point. The outer ends of the yoke 33 are secured to lugs 36 bolted to the rings 37, 38, by bolts 39, passing through said rings and said lug. Screws 40, passing through the ends of the yoke 33 and into the lugs 36, form the pivots to permit the rings and the parts carried thereby, to oscillate thereon. The diaphragm 41 is of the kind which I have described above; that is to say, the diaphragm is formed by reversely folding a sheet of material to form plaits, each plait forming an element of the diaphragm, and each of these plaits or elements is subjected to a torsional tension or strain by the bringing of the folded or plaited sheet of material into a substantially circular form. In these Figs. 9 to 11, the diaphragm is shown practically as being formed from a sheet of material such as is shown in Fig. 2; that is to say, a strip in which each plait is cut away at its inner corners so as to form a recess on each side of the center of the diaphragm to permit of a convenient attachment of the stylus bar to the diaphragm.

As is plainly shown in Fig. 10, the diaphragm 41 is clamped between the rings 37 and 38, and securely held in that position by means of the screws 42 passing through the said rings and drawing them together. I prefer, however, to interpose, between the

rings 37 and 38, and the diaphragm, thin rings 43—43 of a suitable non-metallic and preferably slightly elastic material, one on each side of the diaphragm. These rings 43, may be of fabric, or rubber, or fiber, or any other suitable material to prevent an actual contact between the diaphragm and the metallic rings 37 and 38, and to securely hold the periphery of the diaphragm in a single plane. A suitable small trumpet 11, may be also secured between the rings for the purpose of directing the sound waves. I have shown it plainly in Figs. 9 and 10 as composed of a slightly flaring substantially conical member having a flange 11' clamped between the rings 37 and 38, the screws 42 passing therethrough. The periphery of the diaphragm 41 is clamped between the intermediate rings 43, and held thereby in a single plane as plainly shown in Fig. 10.

The bottom of the reproducer is provided with a suitable support for the stylus bar, said support comprising a bar 44 secured to the ring 38 by screws 45, or in any other suitable manner. The said bar 44 may carry a block 46 rigidly secured thereto and upon the lower side of said block, I mount the stylus bar. Any suitable mounting for the stylus bar may be employed, but in the said modification illustrated in Figs. 9 to 11, I have shown the block 46 as provided with a pair of alined knife edges 47 engaging suitable recesses and lateral extensions 48 of the stylus bar 49. Each lateral extension is provided with a spring 50, one end of which is attached to said extension 48, and the other end of which extends outwardly and is provided with a hole through which a screw 51 passes, the head of the screw engaging the end of said spring 50 and the screw being threaded in a suitably tapped plate 52 carried by the said block 46. In this way the stylus bar is yieldingly held upon the knife edges 47, but is free to oscillate upon them as bearings.

The lower end of the stylus bar is provided with a suitable set screw 53 for securing the stylus 54 in the socket therein. The stylus bar 49 may have a portion 49' extending at an angle to the stylus carrying portion and it may then extend upwardly as at 55 to the point of attachment to the center of the diaphragm. I have shown the said upwardly extending portion 55 as being curved in order to make it slightly yielding, and the point between the portions 49' and 55 as being materially weakened to enable the stylus bar to readily bend or spring or give slightly at this point to transform the vibratory movement of the stylus into a reciprocatory movement of the portion 55 which is directly attached to and consequently communicates its motion to the center of the diaphragm.

In adjusting the reproducer to the re-



corded surface, the arm 30 should be set at such a height that the stylus will be given a slight rake to the recorded surface, as plainly shown in Fig. 9. This will permit the record to slide freely beneath the stylus without unduly scratching the same and cause the stylus to engage the record with a sufficient pressure to insure the tracking of the stylus in the record groove. The record may then slide freely beneath the stylus, and the whole reproducer may swing slightly on the bolts or pins 40 to allow for any irregularity or unevenness or warp in the recorded surface.

In order that the stylus may not bear too heavily upon the record, the trumpet 11 may be provided with a suitable counterbalance-weight 59.

From the preceding description it will be plain that the whole construction is such that the trumpet, diaphragm, rings and stylus attached thereto may be swung upwardly about the bolts or pin 34 as a pivot for the purpose of replacing the stylus or for throwing the whole device into an inoperative position, as indicated in dotted lines in Fig. 9.

In operation it will be apparent that when the record is given a rotary movement from the turn-table 20 and the stylus 54 engages the record 21, the whole reproducer will swing about the stem or pintle 31 as a pivot allowing the needle or stylus 54 to track across the record and the stylus will be caused to assume the correct angle to the recorded surface by the adjustment of the step 32 against which the stem or pintle 31 abuts, and further, that the stylus will be prevented from bearing too heavily upon the record by the counter-weight 59 attached to the upper end of the trumpet 11.

In all the forms which I have above described, it will be seen that the diaphragm is constructed upon the same principle, and that it is mounted in substantially the same way, and that any suitable manner of securing the stylus to the center of the diaphragm may be employed, and while I have shown a small trumpet 11 in connection with the constructions which I have illustrated, it is to be understood that the trumpet may be entirely dispensed with if desired, the function being to give direction to the sound waves rather than to increase the volume of the sound reproduced by the diaphragm.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States, is:—

1. A phonic diaphragm having a plurality of reversely flexed sound-responsive elements, each of said elements being held distorted from a normal shape under a torsional stress and tending to return to said normal shape.

2. In a sound box, the combination of a

diaphragm composed of a plurality of radial sound-responsive elements, tending to assume a position coincident with a plane surface, and means to hold said elements in a flexed position.

3. A phonic diaphragm having a plurality of radial flexed sound-responsive elements, each element held under a torsional stress due to its flexed condition and tending to return to an unflexed condition.

4. A phonic diaphragm, having its entire surface composed of adjacent like elements arranged to form both salient and reëntrant angles, said angles forming alternate radial ridges and grooves, each of said elements being held distorted from a normal condition by a torsional stress and tending to return to said normal condition.

5. In a sound box, the combination of a diaphragm, having a plurality of radial sound-responsive elements tending to assume a position coincident with a plane surface, and means to hold said elements in a flexed position, with the outer ends of said flexed elements in a single plane.

6. A phonic diaphragm, having a plurality of sound-responsive elements, the angle between adjacent pairs of which progressively varies.

7. A phonic diaphragm including a plurality of like elements, each element being arranged between and inclined with respect to adjacent elements, each element being held under a torsional stress, and said elements tending to assume positions coincident with a common plane.

8. A phonic diaphragm, comprising a plurality of helical sound-responsive elements, which tend to form a common plane surface.

9. A phonic diaphragm, having a plurality of torsioned elements radially disposed, said elements tending to assume positions coincident with a common plane.

10. A circular phonic diaphragm, having a plurality of elements, the slope of which transverse to the radius varies continuously from a maximum at the center of the diaphragm to a minimum at the periphery.

11. A phonic diaphragm, having a plurality of elements of transverse slope, varying progressively along a radius.

12. A phonic diaphragm having a plurality of like torsioned elements which tend to return to a normal configuration.

13. A phonic diaphragm, formed of a plurality of sound-responsive elements, each of which is distorted under tension intermediate of its peripheral portions by the relationship of adjacent elements, and positive means for restraining the peripheral portions, said elements tending to return to a normal configuration.

14. In a sound recording or reproducing machine, a diaphragm composed of a plurality of elements, each of which is normally



subjected to torsional stress while in inoperative position, a stylus operatively connected to said diaphragm, and means to hold the edges of said diaphragm in substantially a single plane.

15. In a sound recorder or reproducer, a diaphragm composed of a plurality of elements, each of which is subjected to a torsional stress, the inner edge of each element being substantially parallel to the axis of the diaphragm.

16. In a sound recorder or reproducer, a diaphragm composed of a plurality of elements, each of which is subjected to a torsional stress, the inner edge of each element being substantially parallel to the axis of the diaphragm, and the corners of each element at the center of the diaphragm being beveled to form a recess at the center of the diaphragm.

17. In a sound recorder or reproducer, a diaphragm composed of a plurality of elements radially arranged, the inner edge of each element being substantially parallel to the axis of the diaphragm, and the outer edge of each element being substantially in a plane normal to the axis of said diaphragm.

18. In a sound recorder or reproducer, a diaphragm composed of a plurality of elements, the inner edge of each element being substantially parallel to the axis of the diaphragm, and means to hold the outer edge of each element in a single plane.

19. In a sound recorder or reproducer, a diaphragm composed of a plurality of helical elements radiating from the center of the diaphragm, and a stiffening ring secured to the outside edges of said elements.

20. In a sound recorder or reproducer, a diaphragm composed of a plurality of elements, each of which is distorted by a torsional stress and tends to return to a normal configuration, and clamping rings on each side of the peripheral edge of the diaphragm holding said edge in a single plane.

21. A phonic diaphragm comprising a body portion of substantially uniform thickness of material and arranged substantially in the form of a double cone.

22. A phonic diaphragm, comprising a body portion consisting of a single thickness of material and arranged substantially in the form of a double cone, having a substantially flat flexible rim and oppositely disposed radial plaits, tapering outwardly in depth from the center of said body portion.

23. A phonic diaphragm comprising a body portion consisting of a single thickness of material, having a substantially circular rim arranged in a single plane, said body portion being provided with radial plaits tapering outwardly in depth from the central portion of the diaphragm, said plaits having their alternate angles upon opposite

sides of said plane and arranged in substantially balanced or symmetrical relationship thereto.

24. The combination with a phonic diaphragm of means normally holding said diaphragm, when in inoperative position, under a torsional stress.

25. A phonic diaphragm having a portion normally held, when in inoperative position, under a torsional stress and tending to return to its original state.

26. In a sound box, the combination with an annular support, of a diaphragm carried thereby, a bar secured to opposite portions of said support, a block rigidly secured to said bar, a stylus bar phonetically connected to said diaphragm and provided with oppositely disposed lateral extensions, alined knife edges between said extensions and said block and yielding means for holding said bar in position with respect to said block.

27. In a sound box, the combination with an annular support, of a diaphragm carried thereby, a bar secured to opposite portions of said support, a block rigidly secured to said bar, a stylus bar phonetically connected to said diaphragm and provided with oppositely disposed lateral extensions, alined knife edges between said extensions and said block, and yielding means for holding said bar in position with respect to said block, said yielding means comprising a spring between each of said extensions and said block.

28. In a sound box, the combination with a diaphragm, of a stylus bar comprising an inner portion phonetically connected to said diaphragm, and a comparatively rigid outer portion mounted to oscillate about a fixed axis and forming a continuation of, and extending substantially at a right angle with, said inner portion, said bar having a flexible reduced portion connecting and forming a hinge between said inner and outer portions at the vertex of said angle, and the oscillation of said outer portion producing a longitudinal reciprocation of said inner portion, said flexible portions being connected only to said inner and outer portions.

29. In a sound box, the combination with a diaphragm, of a stylus bar comprising an inner portion phonetically connected to said diaphragm, and a comparatively rigid outer portion mounted to oscillate about a fixed axis and forming a continuation of, and extending substantially at a right angle to, said inner portion, said bar having a flexible reduced portion connecting and forming a hinge between said inner and outer portions at the vertex of said angle, and the oscillation of said outer portion producing a longitudinal reciprocation of said inner portion, and said inner portion being partly in the form of a yielding loop to permit the effective length of said inner portion to be varied slightly

by the oscillation of said outer portion, said flexible portions being connected only to said inner and outer portions.

5 30. In a sound box, the combination with a support, of a diaphragm carried thereby, and a stylus bar, said stylus bar including a comparatively rigid portion mounted to oscillate on said support, and a connecting portion between said first mentioned portion and said diaphragm, said portions being  
10 joined by a flexible reduced portion forming a hinge between and connected only to said first mentioned portions, and the oscillation

of said first mentioned portion resulting in the longitudinal reciprocation of said connecting portion. 15

31. A phonic diaphragm having a portion normally distorted under a twisting stress while in an inoperative position, and tending to return to its original form. 20

In witness whereof I have hereunto set my hand this 11th day of March, A. D. 1910.

LOUIS LUMIERE.

Witnesses:

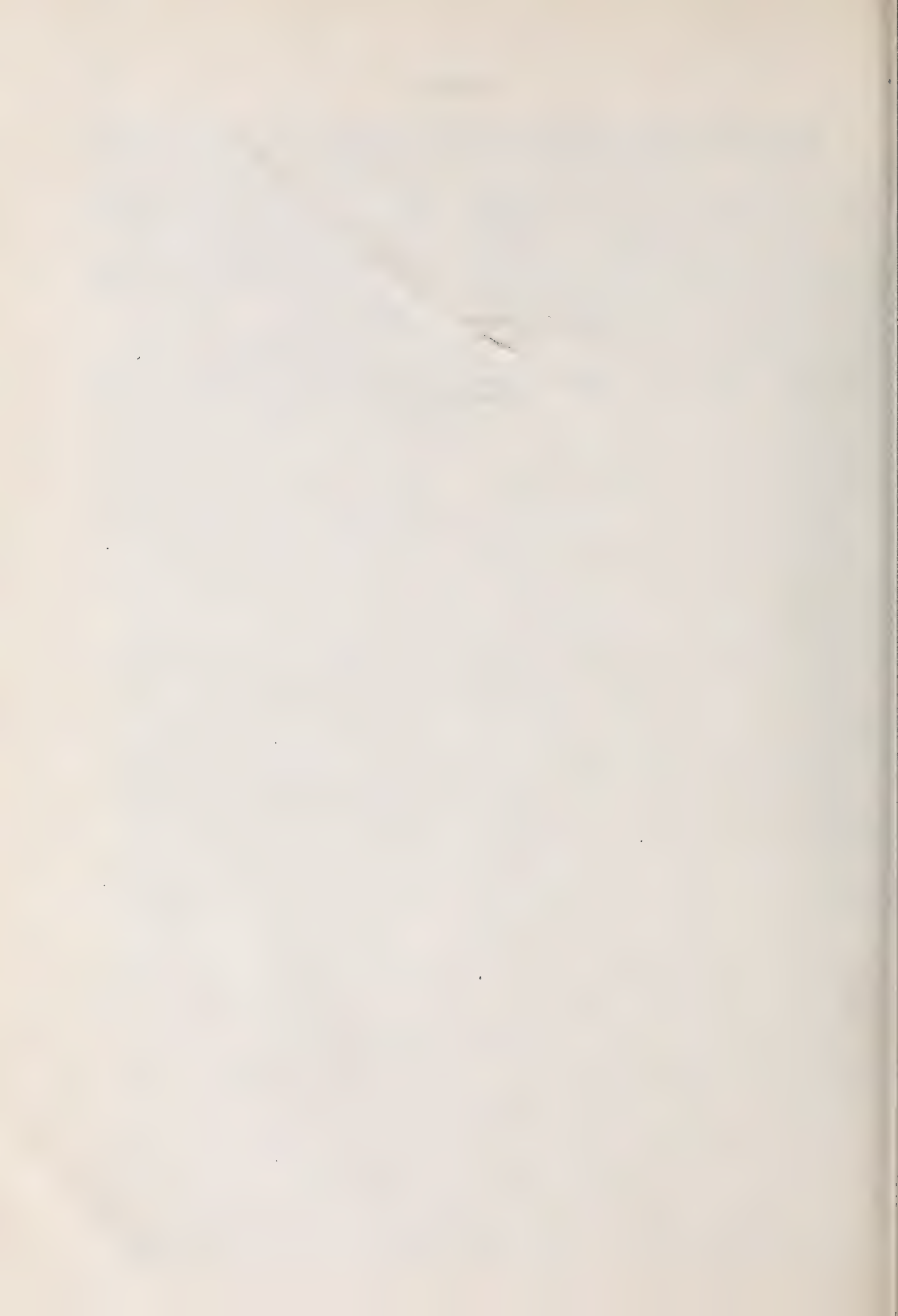
PAUL H. CRAM,

SEPTIMUS BRACHER.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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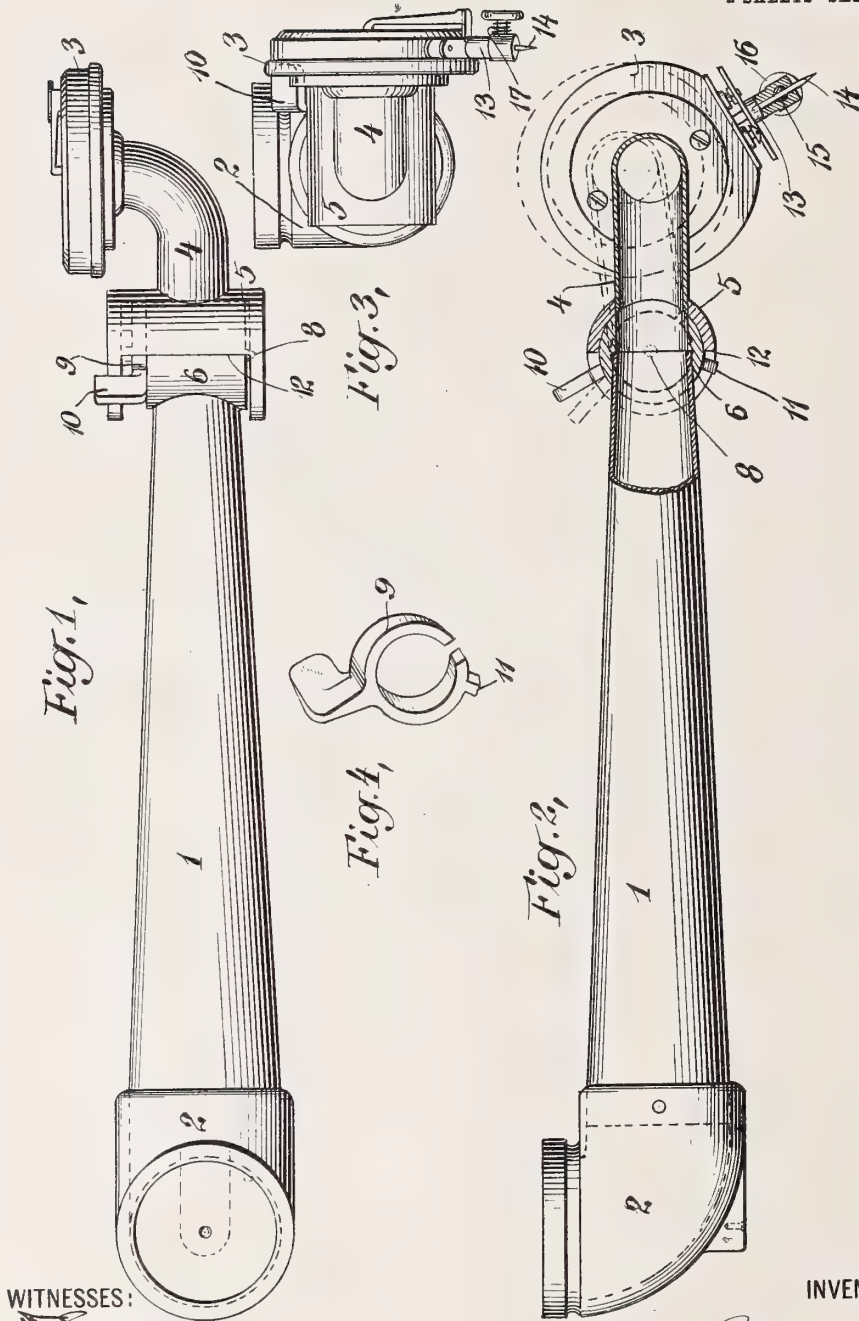


J. A. RABBITT.  
TALKING MACHINE.  
APPLICATION FILED FEB. 28, 1910.

1,037,983.

Patented Sept. 10, 1912.

2 SHEETS—SHEET 1.



WITNESSES:

*N. Edwards.*  
*Henry Meyer.*

INVENTOR

*James A. Rabbitt*  
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ATTORNEY

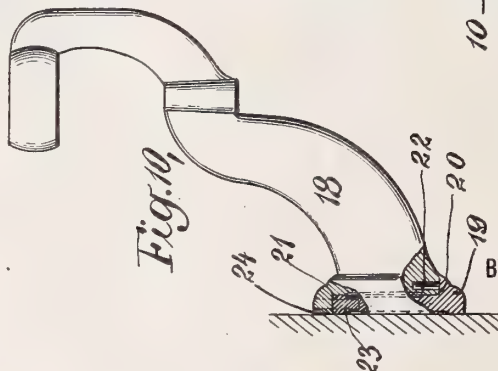
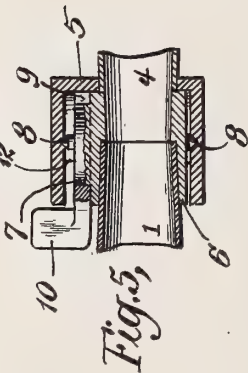
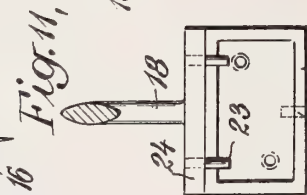
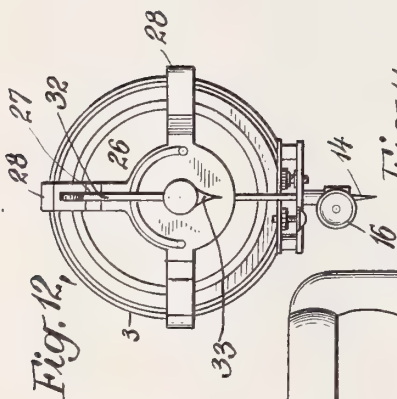
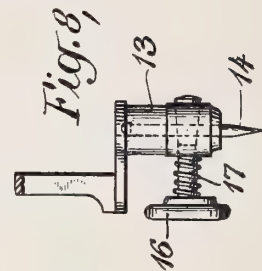
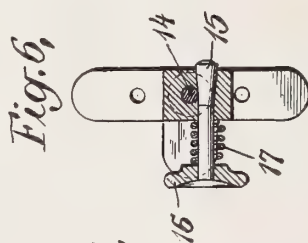
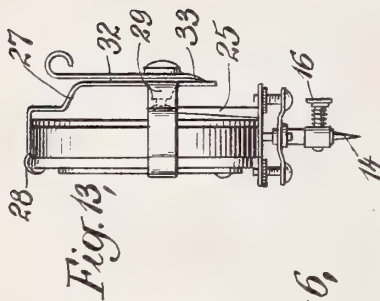
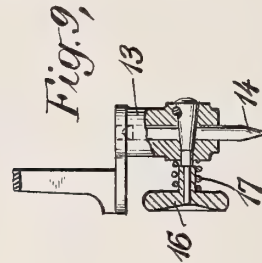
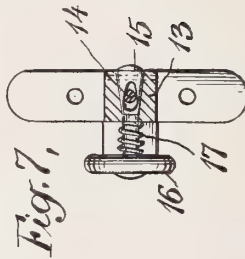
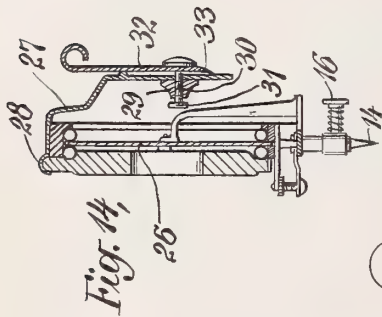


J. A. RABBITT.  
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2 SHEETS—SHEET 2.



WITNESSES:

*Edwards*  
*Henry Meyer.*

INVENTOR

*James A. Rabbitt*

BY *Edwards*  
ATTORNEY

# UNITED STATES PATENT OFFICE.

JAMES A. RABBITT, OF YOKOHAMA, JAPAN.

TALKING-MACHINE.

1,037,983.

Specification of Letters Patent.

Patented Sept. 10, 1912.

Application filed February 28, 1910. Serial No. 546,270.

*To all whom it may concern:*

Be it known that I, JAMES A. RABBITT, a citizen of the United States, residing in the city of Yokohama, Empire of Japan, have  
5 invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

This invention relates to talking-machines, and its object is to effect certain improvements in the construction of these machines whereby they are made more convenient to use, whereby a faithful reproduction of the recorded sounds is obtained, and whereby  
10 modified as desired.

I have illustrated the preferred embodiment of my invention in the accompanying drawings, in which—

Figure 1 is a top view of the tone-arm; Fig. 2 is a side view of the same, broken away and sectioned in part; Fig. 3 is a front view of the sound-box and tone-arm; Fig. 4 is a perspective view of the lifting device for the sound-box; Fig. 5 is a sectional  
25 view, illustrating the connection between the sound-box and tone-arm; Figs. 6, 7, 8 and 9 are detail views, illustrating the holder for the stylus; Fig. 10 is a sectional elevation of the supporting arm for the tone-arm; Fig. 11 is a view of one of the parts of this supporting arm; Fig. 12 is a side view of the sound-box, showing the sound-modifier applied thereto; Fig. 13 is an end view of the sound-box, and Fig. 14 is a sectional  
30 view of the sound-box.

Referring first to Figs. 1 to 5 inclusive, 1 indicates the tapering tone-arm, having its larger end secured to a coupling-member 2, which supports the tone-arm so that the latter and the sound-box secured thereto may  
40 turn freely about a vertical axis. The sound-box is shown at 3. This sound-box is connected to a short tube 4, the end of which enters and is secured within an opening in the cylindrical shell 5. The smaller end of the tone-arm 1 enters and is secured within an opening in a cylindrical piece 6, which is adapted to be received within the shell 5. When the sound-box is in operative position, the tube 4 is in axial alignment with the openings through the piece 6 and the tone-arm 1, so that a passageway for the sound-waves free from obstructions is provided. On one side of the cylindrical  
55 piece 6, is a cylindrical extension 7 of somewhat smaller diameter than the body of the

piece 6, and at opposite sides of the piece 6 are provided pivot-pins 8 extending into depressions in the shell 5, so that the latter may turn freely upon the piece 6. A split  
60 clamping-ring, preferably of the form shown in Fig. 4, is provided upon the cylindrical extension 7 of the piece 6. This ring 9 has a fingerpiece 10, whereby it may be turned relatively to the piece 6, and also it  
65 has a projection 11 adapted to engage the wall 12 of the shell 5. Normally the ring 9 clamps the extension 7 so tightly that it will not move thereon, but by applying a small amount of pressure to the fingerpiece 10 the  
70 grip of the split ring upon the extension 7 may be relieved somewhat and the ring turned thereon. When the ring is so turned, the projection 11 engages the wall 12 and turns the shell 5 upon the piece 6, thereby  
75 raising the sound-box 3 so as to lift the stylus from the sound-record, as indicated by the dotted lines in Fig. 2. When the sound-box has been so raised and the fingerpiece 10 released, the split ring 9 will grip  
80 the extension 7 so tightly that it will not move thereon, and the sound-box will be supported in this raised position, due to the fact that the wall 12 of the shell 5 bears against the projection 11 of the clamp. 85

Referring to Figs. 6, 7, 8 and 9, the means employed for securing the stylus in its holder will be described. The stylus-holder 13 has a lengthwise opening therein to receive the stylus 14, and it also has a transverse opening which is tapered at one end and which is adapted to receive a pin 15 correspondingly tapered at one end. At its opposite end, the pin 15 has a head 16 secured thereto and a spiral spring 17 is coiled  
95 about the pin 15. In order to secure the stylus 14 in the opening in the holder 13, it is only necessary to move the pin 15 in the direction of its axis by pressing upon the head 16; then insert the stylus 14 in its  
100 opening, and then release the pin 15, whereupon the spring 17 will move the pin in the direction of its length until the tapered side thereof engages the stylus 14 and holds it firmly in its opening. 105

The construction illustrated in Fig. 7 is similar to that illustrated in Fig. 6, except that the pin 15 has an opening formed therein, the side walls of which are inclined relatively to the length of the pin. The  
110 stylus 14 is adapted to pass through this opening in the pin 15, and when the head 16



is released and the pin is moved by the spring 17, the stylus 14 will be gripped on opposite sides by the converging walls of the opening in the pin 15.

5 The tone-arm is pivotally mounted upon a supporting arm 18 constructed as shown in Figs. 10 and 11. In securing this arm to the motor-box of the machine, I provide a metallic plate 19 adapted to be perma-  
10 nently secured to the motor-box of the machine and so arranged that the arm 18 may be readily mounted thereon or detached therefrom. To this end, I provide upon the member 19 horizontal supporting surfaces  
15 20 and 21, the former having a pin 22 projecting upwardly therefrom and the latter having two openings extending downwardly therefrom. The lower end of the arm 18 is formed to coact with this member  
20 19, and for this purpose has an opening formed in the bottom thereof adapted to receive the pin 22 and two pins 23 extending downwardly from a projecting portion 24.

Referring now to Figs. 12, 13 and 14, I  
25 will describe the means employed for modifying the tone of the reproduced sounds. The sound-box has a stylus-lever 25 of the usual or any suitable construction, adapted to be operated by the diaphragm 26 of the  
30 sound-box. To provide for modifying the sounds, I employ a sheet-metal support 27 having three arms which may be carried over and folded upon the sound-box, as shown at 28. Secured to this frame 27, is a  
35 stud 29, having a threaded opening therein adapted to receive a threaded pin 30. At its inner end, this pin carries a pad 31 of soft material, such as felt. To the outer end of the pin 30, is secured an operating handle  
40 32, and this handle may be extended to form an index 33 coöperating with a suitable scale on the frame 27. By turning the handle 32, it will be seen that the pad 31 will be moved more or less into coaction with  
45 the stylus-lever 25, so as to dampen the movements thereof in response to the vibrations of the diaphragm 26. By moving the handle 32 in this way, such an adjustment of the position of the pad 31 may be ob-  
50 tained as will make the reproduced sounds of the desired amplitude.

Having now described my invention, what I claim as new therein and desire to secure by Letters Patent is as follows:—

55 1. In a talking-machine, a tubular sound-conveyer, a sound-box, a tubular extension on the sound-box, means for connecting the end of said extension to the end of said con-

veyer and in axial alinement therewith, comprising a cylindrical member secured 60 to one of said parts and a shell secured to the other and having said member pivotally mounted therein, and a clamp movable upon said member adapted to grip the same and also adapted to coact with a part on said 65 shell to position the shell relatively to the member, substantially as set forth.

2. In a talking-machine, a tubular sound-conveyer, a sound-box, a tubular extension on the sound-box, means for connecting the 70 end of said extension to the end of said conveyer and in axial alinement therewith, comprising a cylindrical member secured to one of said parts and a shell secured to the 75 other and having said member pivotally mounted therein, a clamp on said member adapted to grip the same, a handle on the clamp, and coacting engaging projections on the clamp and said shell, substantially as set forth. 80

3. In a talking-machine, a tubular sound-conveyer, a sound-box, a tubular extension on the sound-box, means for connecting the 85 end of said extension to the end of said conveyer and in axial alinement therewith, comprising a cylindrical member secured to one of said parts and a shell secured to the other and having said member pivotally 90 mounted therein, a split ring on said member adapted to grip the same, a handle on said ring for opening the latter and moving it upon the member, and coacting engaging portions on the ring and on said shell, substantially as set forth.

4. In a talking-machine, a tubular sound- 95 conveyer, a sound-box, a tubular extension on the sound-box, means for connecting the end of said extension to the end of said conveyer and in axial alinement therewith, comprising a cylindrical member secured 100 to one of said parts and closed at its ends, and a shell secured to the other of said parts, having an opening on one side and having said member pivotally mounted therein, and a clamp movable upon said member pro- 105 jecting through said opening in the shell and adapted to be moved about said member and to engage and actuate said shell, substantially as set forth.

This specification signed and witnessed 115 this 5th day of February, 1910.

JAMES A. RABBITT.

Witnesses:

GENJI KURIBARA,  
MUSATUO O. KASAVA.



PHONOGRAPH.

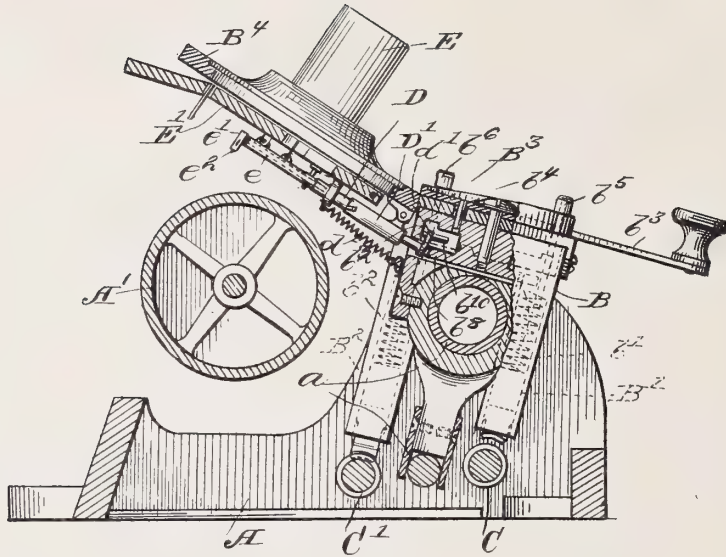
APPLICATION FILED JAN. 11, 1909.

**1,038,621.**

Patented Sept. 17, 1912.

2 SHEETS—SHEET 1.

*Fig. 1*



*Fig. 3*

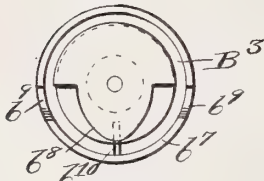


Fig. 4



Fig. 5

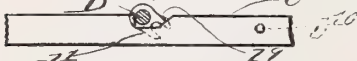
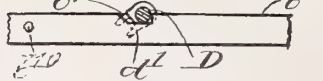
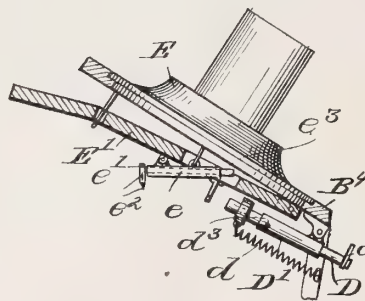


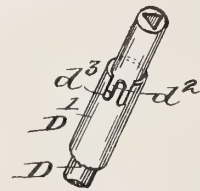
Fig. 6



*Fig. 2*



*Fig. 7*



Witnesses:

J. C. Turners  
Jno. F. Oberlin

*Inventor:*

Harry B. McQuilty  
by J. B. Fay  
Attorney.



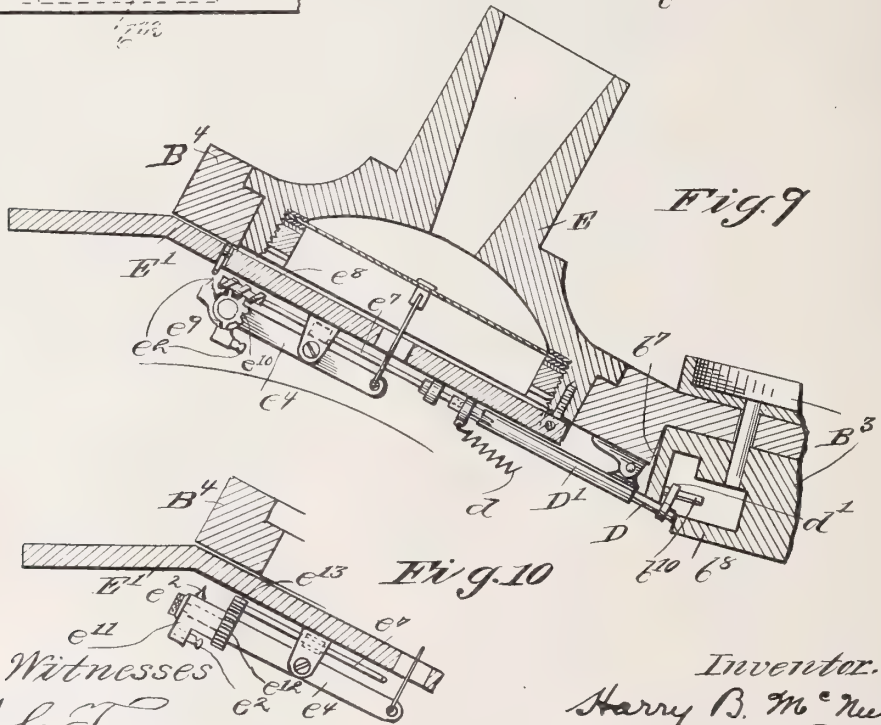
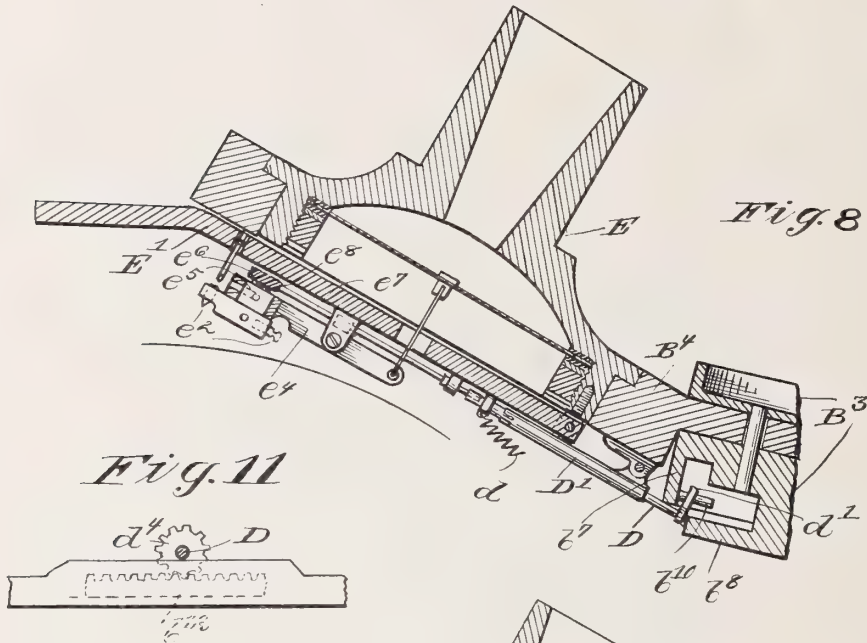


H. B. McNULTY.  
 PHONOGRAPH.  
 APPLICATION FILED JAN. 11, 1909.

1,038,621.

Patented Sept. 17, 1912.

2 SHEETS—SHEET 2.



Witnesses  
*J. C. Turner*  
*Jno. T. Oberlin*

Inventor.  
*Harry B. McNulty*  
 by *J. B. Fay*  
 Attorney.

# UNITED STATES PATENT OFFICE.

HARRY B. McNULTY, OF EAST CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNITED STATES PHONOGRAPH COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

## PHONOGRAPH.

1,038,621.

Specification of Letters Patent.

Patented Sept. 17, 1912.

Application filed January 11, 1909. Serial No. 471,657.

*To all whom it may concern:*

Be it known that I, HARRY B. McNULTY, a citizen of the United States, and a resident of East Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Phonographs, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The present invention, relating as indicated, to phonographs, has more particular regard to the provision of suitable mechanism for adapting a phonograph to optionally play upon records having threads of different fineness, as for instance, upon records having 100 and 200 lines to the inch, respectively, or as they are currently known, "two minute" and "four minute" records. To effect such adaptation of the machine, it is necessary that the reproducer be fed along the record at a different rate of speed in each case, and that a stylus of a different character, corresponding to the fineness of the thread, be properly positioned in the one case to play on the fine thread, in the other upon the coarse thread. One form of mechanism for conjointly effecting the two adjustments referred to is illustrated in my co-pending application, Serial No. 463,942, filed November 23, 1908, and the present invention is in part an improvement of such earlier mechanism, and in part an adaptation of the same to several variant forms of reproducer from the preferred form there shown.

Said invention, then, consists of the means hereinafter fully described, and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but several of the various mechanical forms in which the principle of the invention may be used.

In said annexed drawing:—Figure 1 is a transverse sectional view of a phonograph embodying my several improvements in one approved form; Fig. 2 is a similar view of the reproducer and that portion of the carriage in which said reproducer is seated, showing parts of the latter in a different op-

erative position than that illustrated in Fig. 1; Fig. 3 is a bottom plan view of an actuating cam member that forms a feature of the machine; Figs. 4, 5 and 6 respectively illustrate in different operative positions, a development of one of the cam elements of such cam member; Fig. 7 is a perspective view of another detail of the machine, viz. the key whereby the adjustment of the reproducer stylus is secured; Fig. 8 is a sectional view of the reproducer and the portion of its carriage corresponding to that of Fig. 1, but showing the adaptation of my invention to a different construction of stylus lever; Figs. 9 and 10 similarly illustrate the adaptation of such invention to other forms of stylus lever; and Fig. 11 shows a detail of the construction of Figs. 8 and 9 in modified form.

It has not been deemed necessary for present purposes to illustrate the general construction of the phonograph in greater detail than is afforded in the sectional view of Fig. 1 wherein the support for the record receiving mandrel  $A'$  is not shown, but merely its position relatively to the base  $A$  and to the ways  $a$  upon which is slidably mounted the carriage  $B$  for the reproducer. Movement of this carriage along such ways is secured by connecting the same with one or the other of two feed screws  $C$   $C'$  lying below and parallel with its direction of movement, such engagement being had by means of plungers  $B'$   $B''$  reciprocably mounted in the carriage, the lower ends of which are in the form of sectional nuts adapted to coöperate with such feed-screws respectively. Springs  $b'$   $b''$ , provided in connection with the plungers, operate normally to retain the same in engagement with the corresponding feed-screw, while to control such engagement there is rotatably mounted on the upper face of the carriage, a disk  $B^3$  provided with an operating handle  $b^3$  and bearing a cam  $b^4$  adapted to engage the upper ends  $b^5$   $b^6$  of the plungers respectively.

The disk  $B^3$ , in the form shown, is a composite construction, being made up of an upper section bearing the cam  $b^4$  just referred to, and a lower section incased within the carriage body. Such lower section is, however, fixed to the upper section so as to rotate therewith, just as though said sections were integral.



The under face of the lower section of cam disk B<sup>3</sup> (see Fig. 3) is provided with a raised edge b<sup>7</sup> forming a cam adapted to laterally engage a key D that is both rotatably and longitudinally movable within a sleeve D' pivoted to the under side of the rearwardly projecting annular portion B<sup>4</sup> of the carriage wherein the reproducer E is seated when in use. Disk B<sup>3</sup> is further provided with a heart-shaped cam b<sup>8</sup> that is adapted to terminally engage said key D to advance the same. A tension spring d connected with the outer end of the key serves both to retract it and to depress its outer end against the operation of the cam elements just referred to. Such raised cam edge b<sup>7</sup> however, is formed at substantially opposite points in its extent with notches b<sup>9</sup> that permit the lowering of the outer end of the key at the same time that its retraction is rendered possible by heart-cam b<sup>8</sup>, such position of the two cam elements on the under face of the disk corresponding with the position of the cam b<sup>4</sup> on its upper face that permits operative engagement of one or the other of the two spring pressed plungers B' B<sup>2</sup> with its feed screw C or C'. Intermediate between the two notches b<sup>9</sup> in cam b<sup>7</sup>, so as to correspond with the forwardly extending portion of heart-cam b<sup>8</sup>, is a radially disposed pin b<sup>10</sup> that engages a forked arm d' on the rear end of the key so as to rotate the latter first in one direction, and then in the other, depending upon the direction of movement of the cam member B<sup>3</sup>. The amount of such rotation is accurately determined by means of two notches d<sup>2</sup> properly spaced about the inner end of the sleeve D', and adapted to engage a pin d<sup>3</sup> borne on the side of the key (see Fig. 7). The portion of the sleeve lying between the two notches being suitably beveled, makes it necessary merely to carry the key in its rotative movement past the center of such pin to insure a proper positioning of the key, and of the stylus lever or actuating element with which the same engages, as, and for the purpose now to be set forth.

The general construction of the reproducer E illustrated in Figs. 1 and 2, is the same as that shown in the co-pending application previously referred to, and includes a diaphragm (not shown), a floating weight E', a tubular lever e pivoted to said weight and connected to said diaphragm, and a stylus holder e' rotatably held in said lever and provided at its forward end with a plurality of styluses e<sup>2</sup> adapted to operatively contact with a record upon the mandrel A' in different positions of said holder respectively. The rearwardly projecting end e<sup>3</sup> of the holder is made angular to receive the end of the key D when the latter is thrust forward, or advanced, by the conjointly operated cams on the under face of

the disk B<sup>3</sup>, the preliminary oscillation of such key serving to raise the weight into the position shown in Fig. 1, whereby the key and the stylus holder are properly alined for the purpose in question. Pending such engagement, the rotative movement of the key takes place, and as a result, one or the other of the styluses is brought into said operative position, depending upon the direction of said rotation. This movement obviously will be correlated with the movement of a spring-pressed plunger B' or B<sup>2</sup> into engagement with the corresponding feed-screw.

The modification illustrated in Fig. 8 lies, as has been previously intimated, in the construction of the stylus lever which here is shown as a bar of the prevailing form. In the outer end of the bar is rotatably mounted a vertically disposed transverse stud e<sup>5</sup> that forms the stylus holder, the latter bearing the two styluses, e<sup>2</sup> one of which is suitable for operating on an ordinary record of 100 threads per inch, and the other operating on a record having 200 threads per inch. The specific construction of such stylus holder, it may be remarked, forms no part of the present invention, being shown in fact along with the two forms of Figs. 9 and 10, in U. S. Patent No. 904,884. To automatically effect rotation of such stylus holder in a manner similar to that just described in connection with the preceding form of holder, I provide the upper end of the stud e<sup>5</sup> with a gear e<sup>6</sup> and journal in suitable bearings on the under side of the floating weight E' a shaft or spindle e<sup>7</sup>, the outer end of which bears a worm e<sup>8</sup> that is adapted to mesh with said gear in the raised position of the stylus lever illustrated in the figures in question. The rear end of spindle e<sup>7</sup> corresponds with the rear end of the stylus holder in the preceding construction, and is made of similar angular form, so that the key operated by the cam member B<sup>3</sup> is adapted to function in the same manner as before, first to raise the weight, and then to advance into engagement with, and to rotate the spindle, with the result that the stylus holder is likewise rotated to bring first the one, and then the other of the two styluses e<sup>2</sup> into desired operative position.

The stylus holder in the reproducer of Fig. 9 consists of a horizontally disposed transverse stud e<sup>9</sup>, which otherwise operates the same as that of Fig. 8, only a slight modification in the arrangement of the gear e<sup>10</sup> on the stud and of worm e<sup>8</sup> on spindle e<sup>7</sup>, being necessary. The same is true of Fig. 10, wherein the holder consists of a sleeve e<sup>11</sup> rotatably mounted on the forward end of the lever and provided with a spur gear e<sup>12</sup> with which a pinion e<sup>13</sup>, taking the place of worm e<sup>8</sup> on the forward end of spindle e<sup>7</sup> is adapted to mesh.

Inasmuch as it may in practice be difficult, in the case of the last described forms of reproducer, to impart a sufficient rotative movement to key D, by means of the pin  $b^{10}$  engaging with the arm  $d'$  on its rear end, I contemplate the substitution of a short rack  $b^{12}$  for the pin, and of a pinion  $d^4$  for the arm, as shown in Fig. 11. By means of such a rack and pinion it will obviously be possible to secure a complete turn of the shaft, or even more, should this be found desirable.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any one of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, and a plurality of styluses carried by said weight and respectively movable into operative position with respect to a record; and a movable member apart from said weight adapted to raise the same and thereupon actuate said styluses.

2. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, and a plurality of styluses carried by said weight and respectively movable into operative position with respect to a record; and a movable member on said carriage adapted to raise said weight and thereupon actuate said styluses.

3. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, and a plurality of styluses carried by said weight and respectively movable into operative position with respect to a record; and a member apart from said weight, said member having two distinct movements whereby it is respectively adapted to raise said weight and thereupon to actuate said styluses.

4. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage; said reproducer including a diaphragm, a floating weight, and a plurality of styluses carried by said weight and respectively movable into operative position with respect to a record; and a member apart from said weight, said member being oscillatorily and rotatably movable, whereby it is respectively adapted to raise said weight and thereupon to actuate said styluses.

5. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being movable so as to bring either of said styluses into operative position with respect to a record; and a movable member on said carriage adapted to raise said weight and thereupon actuate said stylus holder.

6. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being movable so as to bring either of said styluses into operative position with respect to a record; and a member on said carriage, said member being oscillatorily and rotatably movable to raise said weight and thereupon to actuate said stylus holder, respectively.

7. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being movable so as to bring either of said styluses into operative position with respect to a record; and a member on said carriage, said member being oscillatorily and rotatably movable to raise said weight and actuate said stylus holder, respectively; and means for thus oscillating and rotating said member.

8. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being movable so as to bring either of said styluses into operative position with respect to a record; a sleeve oscillatorily mounted on said carriage; and a member both rotatably and longitudinally movable in said sleeve, oscillation of said sleeve being effective to raise said member against said weight, and longitudinal and rotative movement of said member being respectively effective to engage the same with, and actuate, said stylus holder.

9. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer



including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being movable so as to bring either of said styluses into operative position with respect to a record; a sleeve oscillatorily mounted on said carriage; a member both rotatably and longitudinally movable in said sleeve, oscillation of said sleeve being effective to raise said member against said weight, and longitudinal and rotative movement of said member being respectively effective to engage the same with, and actuate, said stylus holder; and conjointly operable cam means adapted successively to oscillate said sleeve, advance said member, and rotate the same.

10. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being movable so as to bring either of said styluses into operative position with respect to a record; a sleeve oscillatorily mounted on said carriage; a member both rotatably and longitudinally movable in said sleeve, oscillation of said sleeve being effective to raise said member against said weight, and longitudinal and rotative movement of said member being respectively effective to engage the same with, and actuate, said stylus holder; a tension spring connected with said member and adapted both to retract the same and to hold it out of contact with said weight; and conjointly operable cam means adapted successively to oscillate said sleeve, advance said member and rotate the same.

11. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being movable so as to bring either of said styluses into operative position with respect to a record; a sleeve oscillatorily mounted on said carriage; a member both rotatably and longitudinally movable in said sleeve, oscillation of said sleeve being effective to raise said member against said weight, and longitudinal and rotative movement of said member being respectively effective to engage the same with, and actuate, said stylus holder; a tension spring connected with said member and adapted both to retract the same and to hold it out of contact with said weight; and a rotatable plate on said car-

riage provided with a raised edge forming a cam laterally engaging said member to oscillate the same against said spring, with a disk cam terminally engaging said member to similarly advance the same, and with means for rotating said member when thus oscillated and advanced.

12. In mechanism of the class described, a reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, a stylus holder carried by said lever and provided with a plurality of styluses, said holder being movable so as to bring either of said styluses into operative position with respect to a record, and means mounted on said weight for thus moving said holder, said means being normally out of engagement with said holder but being adapted to engage the same in the raised position of said weight.

13. In mechanism of the class described, a reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, a stylus holder carried by said lever and provided with a plurality of styluses, said holder being movable so as to bring either of said styluses into operative position with respect to a record, and a member rotatably mounted on said weight, said member being normally out of engagement with said holder but being adapted to engage the same in the raised position of said weight.

14. In mechanism of the class described, a reproducer including a floating weight, a diaphragm, a lever pivoted to said weight and connected with said diaphragm, a stylus holder carried by said lever and provided with a plurality of styluses, said holder being further provided with a gear and being movable to bring either of said styluses into operative position with respect to a record, and a spindle rotatably mounted on said weight and bearing a gear adapted to mesh with the gear on said holder.

15. In mechanism of the class described, a reproducer including a floating weight, a diaphragm, a lever pivoted to said weight and connected with said diaphragm, a stylus holder carried by said lever and provided with a plurality of styluses, said holder being further provided with a gear and being movable to bring either of said styluses into operative position with respect to a record, and a spindle rotatably mounted on said weight and bearing a gear adapted to mesh with the gear on said holder in the raised position of said weight.

16. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus

holder carried by said lever and provided with a plurality of styluses, said holder being movable so as to bring either of said styluses into operative position with respect to a record; means mounted on said weight for thus moving said holder adapted to operatively engage the same in the raised position of said weight; and a movable member on said carriage adapted to raise said weight and thereupon to actuate said stylus moving means.

17. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being movable so as to bring either of said styluses into operative position with respect to a record; a member rotatably mounted on said weight and adapted operatively to engage said holder in the raised position of said weight; and a member on said carriage, said member being oscillatorily and rotatably movable thus to raise said weight and thereupon to rotate the member thereon.

18. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being further provided with a gear and being movable so as to bring either of said styluses into operative position with respect to a record; a spindle rotatably mounted on said weight and bearing a gear adapted to mesh with the gear on said holder; and a member on said carriage, said member being oscillatorily and rotatably movable to raise said weight and rotate said spindle respectively; and means for thus oscillating and rotating said member.

19. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being further provided with a gear and being movable so as to bring either of said styluses into operative position with respect to a record; a spindle rotatably mounted on said weight and bearing a gear adapted to mesh with the gear on said holder; a sleeve oscillatorily mounted on said carriage; and a member both rotatably and longitudinally movable in said sleeve, oscillation of said sleeve being effective to raise said member against said weight, and longitudinal and

rotative movement of said member being respectively effective to engage the same with, and rotate, said spindle.

20. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being further provided with a gear and being movable so as to bring either of said styluses into operative position with respect to a record; a spindle rotatably mounted on said weight and bearing a gear adapted to mesh with the gear on said holder; a sleeve oscillatorily mounted on said carriage; a key both rotatably and longitudinally movable in said sleeve, oscillation of said sleeve being effective to raise said key against said weight, and longitudinal and rotative movement of said key being respectively effective to engage the same with, and rotate, said spindle; and conjointly operable cam means adapted successively to oscillate said sleeve, advance said key, and rotate the same.

21. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being further provided with a gear and being movable so as to bring either of said styluses into operative position with respect to a record; a spindle rotatably mounted on said weight and bearing a gear adapted to mesh with the gear on said holder; a sleeve oscillatorily mounted on said carriage; a key both rotatably and longitudinally movable in said sleeve, oscillation of said sleeve being effective to raise said key against said weight, and longitudinal and rotative movement of said key being respectively effective to engage the same with, and rotate, said spindle; a tension spring connected with said key and adapted both to retract the same and to hold it out of contact with said weight; and conjointly operable cam means adapted successively to oscillate said sleeve, advance said key and rotate the same.

22. In mechanism of the class described, the combination of a carriage; a reproducer mounted on said carriage, said reproducer including a diaphragm, a floating weight, a lever pivoted to said weight and connected with said diaphragm, and a stylus holder carried by said lever and provided with a plurality of styluses, said holder being further provided with a gear and being movable so as to bring either of said styluses into operative position with



respect to a record; a spindle rotatably mounted on said weight and bearing a gear adapted to mesh with the gear on said holder; a sleeve oscillatorily mounted on  
5 said carriage; a key both rotatably and longitudinally movable in said sleeve, oscillation of said sleeve being effective to raise said key against said weight, and longitudinal and rotative movement of said key being  
10 ing respectively effective to engage the same with, and rotate, said spindle; a tension spring connected with said key and adapted both to retract the same and to hold it out of contact with said weight; and a rotatable  
plate on said carriage provided with a raised  
edge forming a cam laterally engaging said  
key to oscillate the same against said spring,  
with a disk cam terminally engaging said  
key to similarly advance the same, and with  
means for rotating said key when thus os-  
cillated and advanced.  
Signed by me this 7th day of January,  
1909.

HARRY B. McNULTY.

Attested by—

MARY GLADWELL,  
JNO. F. OBERLIN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

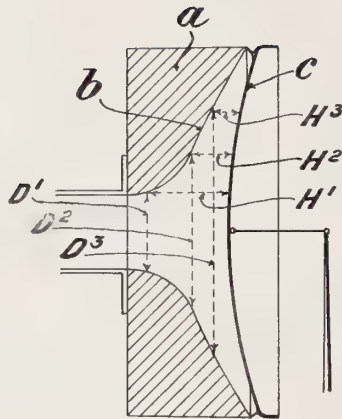




L. LUMIERE.  
ACOUSTICAL INSTRUMENT.  
APPLICATION FILED MAY 18, 1910.

1,039,155.

Patented Sept. 24, 1912.



Witnesses:  
*F. J. Hartmann.*  
*Alston B. Moulton*

Inventor:  
*Louis Lumiere.*

By *Harve Pelt*,  
Attorney.

# UNITED STATES PATENT OFFICE.

LOUIS LUMIERE, OF LYON, FRANCE.

## ACOUSTICAL INSTRUMENT.

1,039,155.

Specification of Letters Patent.

Patented Sept. 24, 1912.

Application filed May 18, 1910. Serial No. 561,929.

*To all whom it may concern:*

Be it known that I, LOUIS LUMIERE, a citizen of the Republic of France, residing at Lyon, in the Republic of France, have invented certain new and useful Improvements in Acoustical Instruments, of which the following is a full, clear, and complete disclosure.

This invention relates to improvements in acoustical instruments such as telephones, microphones, stethoscopes, talking machines, musical instruments, and in general any instrument used for the reception or transmission of sounds.

The invention is described below and illustrated as applied to the sound box of a talking machine.

The invention is particularly applicable to those acoustical instruments in which there is a sound box comprising a substantially stationary wall or side in which there is an opening leading to the ear piece or trumpet or other sound delivering means, and a rigid movable side reciprocated toward and away from the stationary side by suitable means such as the stylus of the talking machine, the said movable side moving in substantially unchanged form throughout its whole area.

In the sound boxes of talking machines and other acoustical instruments the displacement of the movable wall has the effect of producing at the level of the orifice leading to the horn variations in pressure in the air within the sound box. These variations constitute the origin of the production of the sounds and are accompanied by a displacement of the air contained within the sound box, a displacement which travels alternately from the orifice to the periphery of the sound box, and from the periphery to the orifice. If the internal form of the stationary wall is not correct, the displacement of the air within the sound box is subject to variations in speed which give rise to disturbances which absorb work and are injurious to the purity of the sound produced. The method of construction which forms the subject of the present invention overcomes this objection and insures a maximum of effect being obtained with the apparatus.

The invention will be clear upon reference to the accompanying drawing which shows a sectional elevation of a circular sound box constructed according to this invention.

The invention consists in giving the inner face *b* of the stationary wall *a* such a form

that the surface of all cylindrical sections taken between it and the movable wall *c* concentrically with the axis of the orifice are equal; that is to say, if the diameters of these sections are taken as  $D^1$ ,  $D^2$ ,  $D^3$ , and the height of these sections are taken as  $H^1$ ,  $H^2$ ,  $H^3$ , the surfaces of the cylinders  $D^1 H^1 = D^2 H^2 = D^3 H^3$ , etc. It will be understood that under these conditions the instantaneous pressure of the air will be uniform at all points of the surface of the wall *c*, so that the objection referred to above will be avoided and the flow of air in the sound box produced or producing the sounds, toward and away from the orifice will be practically unaffected by the displacement of the movable wall.

It is to be understood that this improvement is applicable whatever may be the form of the movable wall *c*, the interior face *b* of the fixed side *a* being always determined by the same conditions.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States, is:—

1. A sound box for acoustical instruments comprising a movable wall and a stationary wall in which the inner face of the movable wall bears such a form in relation to the inner face of the stationary wall that the surfaces of successive sections taken concentrically with the delivery orifice of the sound box between the inner faces of the two walls are substantially equal.

2. A sound box for acoustical instruments comprising a stationary wall provided with a delivery orifice, and a movable wall arranged opposite the inner surface of said stationary wall, the inner surface of said movable wall and the inner surface of said stationary wall converging radially outwardly toward each other, the surfaces of successive cylindrical sections taken coaxially with said delivery orifice between the inner faces of said walls being substantially equal.

3. A sound box for acoustical instruments comprising a stationary wall provided with a delivery orifice, and a movable wall having an inner convex surface opposed to the inner surface of said stationary wall and opposite said orifice, the inner surfaces of said stationary wall and said movable wall converging radially outwardly from said orifice toward each other and the surfaces of successive cylindrical sections taken

coaxially with said delivery orifice between the inner faces of said walls being substantially equal.

4. In a sound box, the combination of a  
5 fixed wall having a delivery opening coaxial therewith, and a movable wall, the distance between any point in the stationary wall and the point in the movable wall opposite thereof, measured along a line parallel with the  
10 axis of said walls, being the quotient of a

constant, divided by the distance between the said point in the stationary wall and the axis of said sound box.

In witness whereof I have hereunto set my hand this twenty-sixth day of April, A. D. 15  
1910.

LOUIS LUMIERE.

Witnesses:

GASTON JEAUNIAUX,  
MARIN VACHON.

---

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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R. STEINERT.  
 PHONOGRAPH NEEDLE.  
 APPLICATION FILED JULY 1, 1911.

1,039,208.

Patented Sept. 24, 1912.

Fig 1

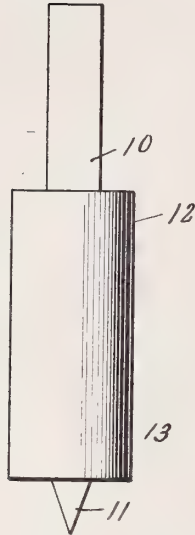


Fig 2

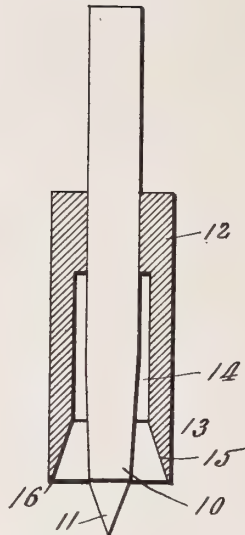


Fig 3

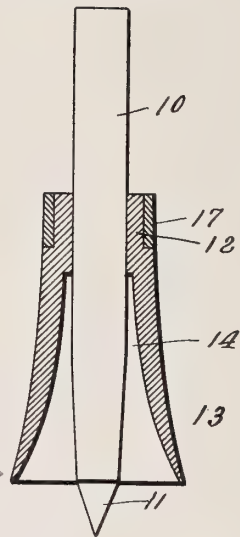


Fig 4

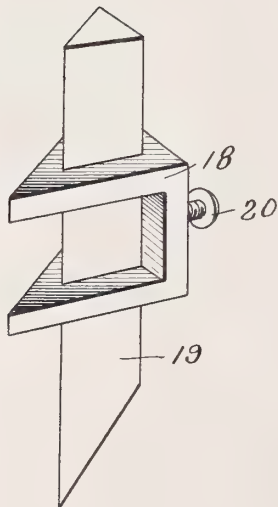
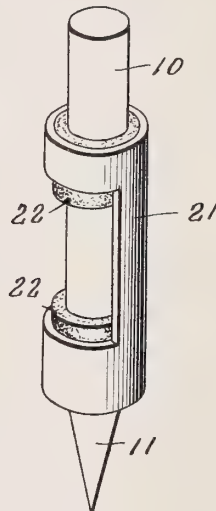


Fig 5



Witnesses

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*A. H. Dingworth*

Inventor

*Rudolph Steinert*

By *August. L. L. L. L. L.*  
 Attorney

# UNITED STATES PATENT OFFICE.

RUDOLPH STEINERT, OF NEW HAVEN, CONNECTICUT.

PHONOGRAPH-NEEDLE.

1,039,208.

Specification of Letters Patent.

Patented Sept. 24, 1912.

Application filed July 1, 1911. Serial No. 636,545.

*To all whom it may concern:*

Be it known that I, RUDOLPH STEINERT, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented new and useful Improvements in Phonograph-Needles, of which the following is a specification.

This invention relates to talking machines, and has for its object to provide an improved stylus for such machines which shall augment the volume and also improve the quality of sound produced by modifying or destroying the metallic sharpness and ringing so noticeable in talking machines now in use. The tones produced with the improved needle are much purer, deeper, and clearer, and the unpleasant scratching noises common to phonograph reproductions are eliminated.

In the accompanying drawings: Figure 1 is an elevation of the improved stylus for talking machines, enlarged; Fig. 2 is a vertical central section of the same; Fig. 3 is a similar view of a modified form of the invention; and Figs. 4 and 5 are perspective views of other modified forms of the stylus.

In the drawing the numeral 10 designates a reproducing needle or stylus for a talking machine made of any suitable material pointed at one end, 11, as shown, to engage the record. Fitting tightly on the stylus at a suitable distance from its pointed end and from its support is a member herein-after called a band, resonator, or sound modifier 12, which may, and preferably has, a depending portion or skirt 13 surrounding the stylus and separated therefrom by a space 14. The bottom of the skirt 13 is beveled on its inner side, as at 15, to form a relatively sharp edge 16. The band and skirt may, however, be made of wood, ivory, or other suitable material, if desired, and instead of making it of cylindrical shape, as in Figs. 1 and 2, it may be of bell form, the lower end of the skirt standing away from the stylus as in Fig. 3, and its wall made gradually thinner from the band 12 to the lower edge 16. A collar 17 may be shrunk or otherwise fastened around the band 12 to hold it on the stylus, especially if the band be of wood or ivory.

A modified form of the band, resonator or sound modifier is illustrated in Figs. 4 and 5, where both the upper and lower ends

of a band or resonator 18 are represented, embracing a stylus. In Fig. 4, a stylus, 19, made of wood is shown, and the resonator held thereon by a set screw 20. In Fig. 5, a band or resonator 21, is clamped tightly on a metal stylus with an interposed felt lining or cushion 22, between the band and the stylus.

Experiment has demonstrated that the best position for attaching the band on the stylus is about three-eighths inch from its point, the skirt extending in the direction of the point about five-sixteenths of an inch. In this position, the tone produced will be beautiful and clear and wholly free from metallic timbre so noticeable in talking machines at present in use. The volume of tone is increased by the use of the resonator which appears to have a gathering effect on the sharp ringing metallic sounds and prevent the issuance thereof from the machine, the tones emitted being of great depth and purity with a noticeable absence of scratching sounds.

While it is a fact that the band or resonator on the stylus purifies and enhances the beauty of the tone, the cause is not wholly understood, but it is believed that the band concentrates and condenses the vibrations at the point of union between the stylus and the band. This giving out of the sound is apparently accomplished in such manner as to soften and remove the metallic sharpness which is present when a plain stylus is used.

It is to be understood that this invention is not limited to the exact position of the band or resonator on the stylus, as further experiments and with different materials may demonstrate some other equally good or better position. The distance of the resonator or sound modifier from the point of the stylus hereinabove given is, however, the best known at the present time. Furthermore, no particular material is claimed as best for the stylus and band. Metal, wood, ivory, fiber, and other hard substances having been used and good results obtained from all.

What I claim is:

1. An attachment for talking machines comprising a cupped resonator provided with an opening therethrough to receive a stylus whereby the resonator may be wholly supported by the stylus intermediate the ends thereof.

2. A stylus for talking machines made of rigid material pointed at one end and having an encircling band rigidly clamped thereon between its ends and provided with  
5 a skirt surrounding said stylus and spaced therefrom and separate from the stylus supporting means.

3. A stylus for talking machines made of rigid material pointed at one end and having  
10 an encircling band firmly clamped thereon between its ends and spaced from its supporting means, said band being provided with a skirt surrounding said stylus open toward its pointed end and spaced  
15 therefrom, its free edge being made relatively sharp.

4. A stylus for talking machines made of rigid material pointed at one end and having an encircling band firmly clamped  
20 thereon between its ends and spaced from its supporting means, said band being provided with a spreading skirt surrounding said stylus open toward its pointed end and spaced therefrom, the wall of said skirt  
25 portion being of gradually lessening thickness toward its free edge.

5. A stylus for talking machines made of rigid material pointed at one end and having an encircling band firmly clamped  
30 thereon above said end and separate from

the stylus supporting means, said band having a pocket opening thereinto and forming a space around said stylus.

6. A stylus for talking machines made of rigid material pointed at one end and having an encircling band also of rigid material firmly clamped thereon between its  
35 ends and spaced from the stylus supporting means, said band having a flange directed toward the pointed end of the stylus  
40 and spaced therefrom.

7. An attachment for talking machines comprising a cup-shaped band designed to be clamped on the stylus of the same and  
45 in contact only therewith its open end being directed toward the point of the stylus.

8. A stylus for talking machines made of rigid material pointed at one end, and an encircling band or sound modifier rigidly  
50 clamped thereon between its ends and wholly supported thereby, said band or sound modifier being provided with a resonance space.

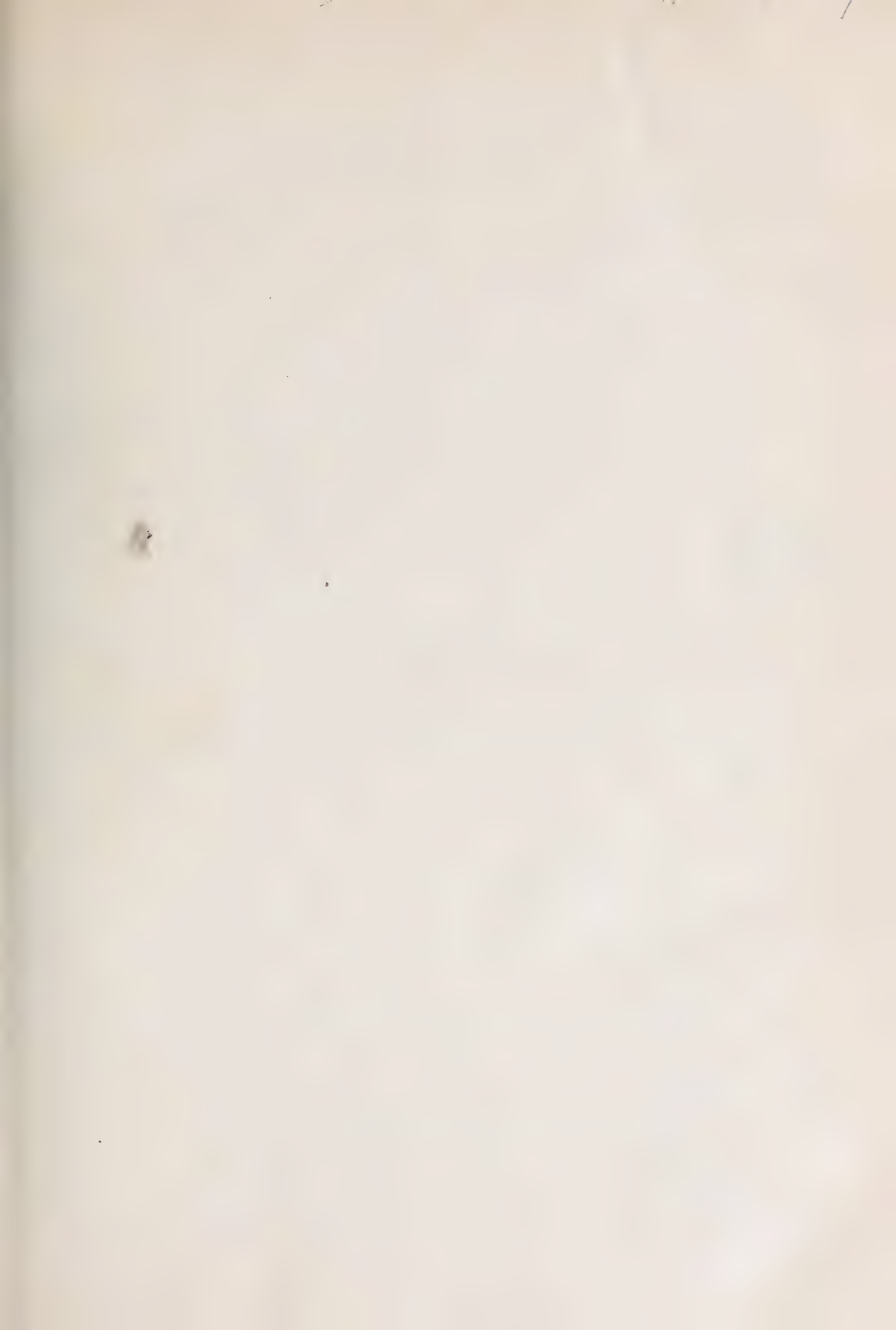
In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.  
55

RUDOLPH STEINERT.

Witnesses:

J. BIRNEY TUTTLE,

ELIZABETH S. STEVENSON.





H. T. SCOTT & L. J. PATTERSON.

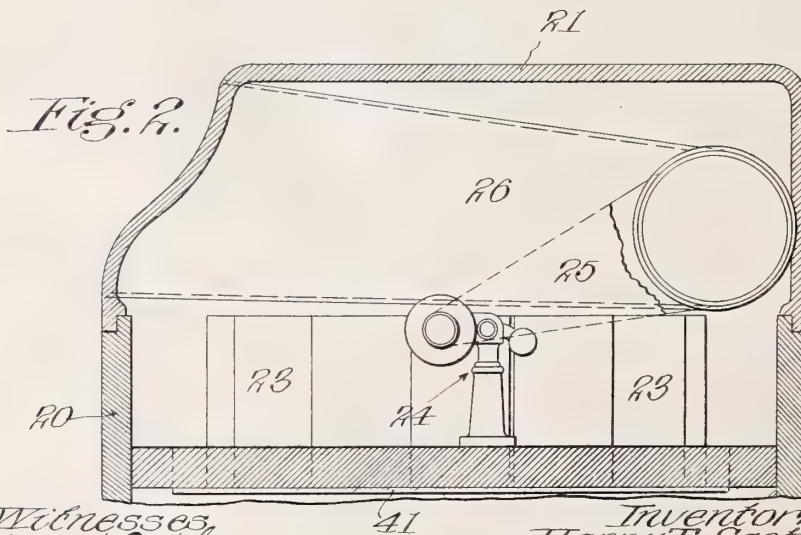
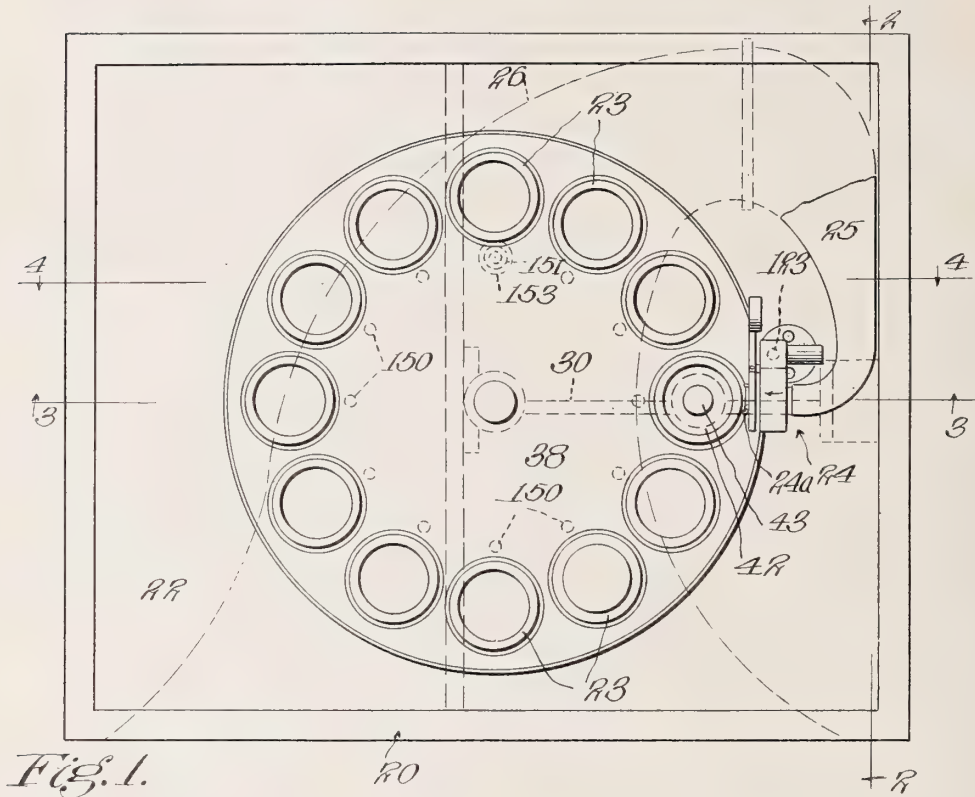
AUTOMATIC PHONOGRAPH.

APPLICATION FILED MAY 27, 1911.

1,040,029.

Patented Oct. 1, 1912.

6 SHEETS-SHEET 1.



Witnesses,  
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H. T. SCOTT & L. J. PATTERSON.

AUTOMATIC PHONOGRAPH.

APPLICATION FILED MAY 27, 1911.

1,040,029.

Patented Oct. 1, 1912.

6 SHEETS—SHEET 2.

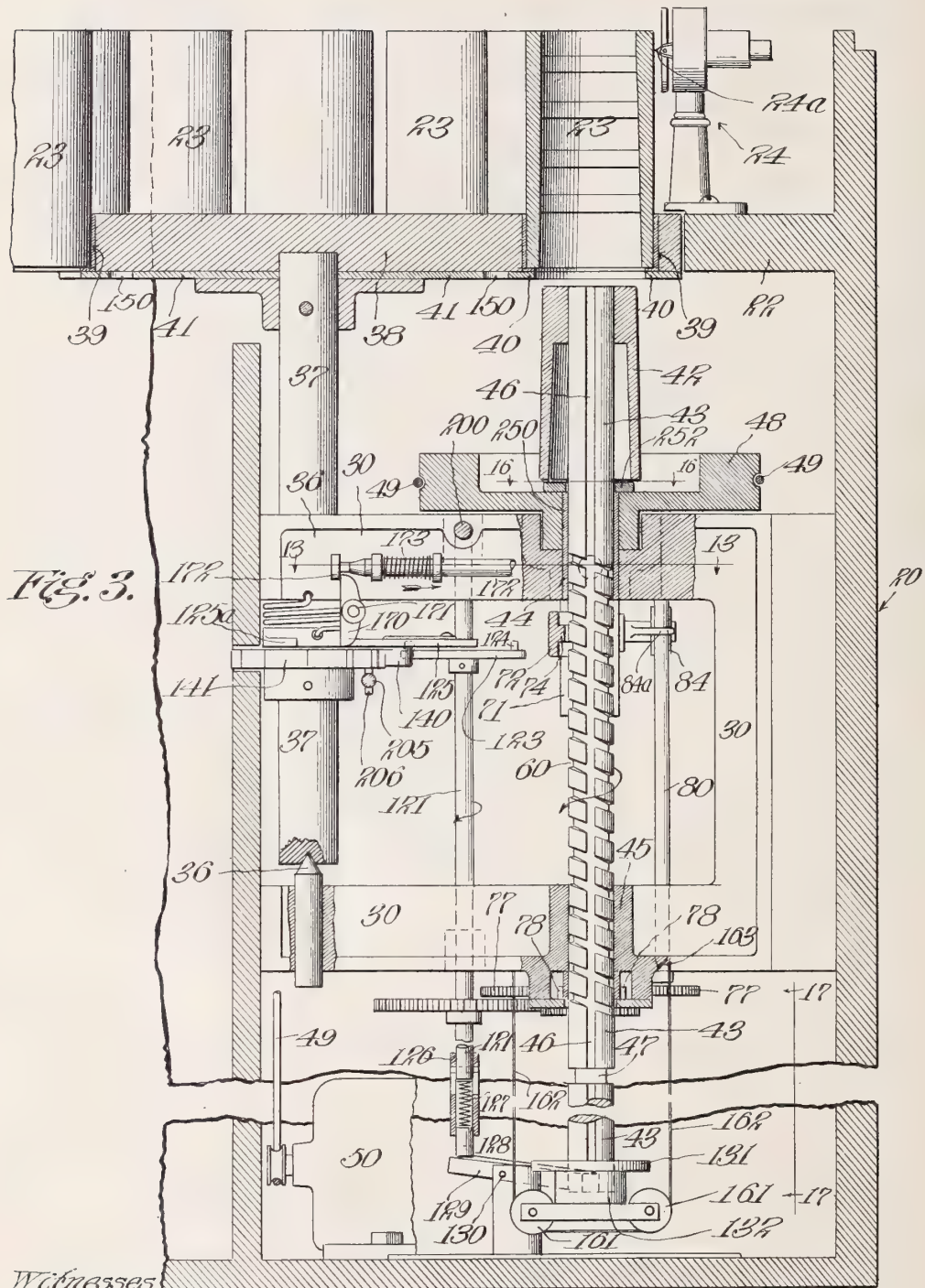


Fig. 3.

Witnesses  
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Inventors—*Harry T. Scott and*  
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H. T. SCOTT & L. J. PATTERSON.

AUTOMATIC PHONOGRAPH.

APPLICATION FILED MAY 27, 1911.

1,040,029.

Patented Oct. 1, 1912.

6 SHEETS—SHEET 3.

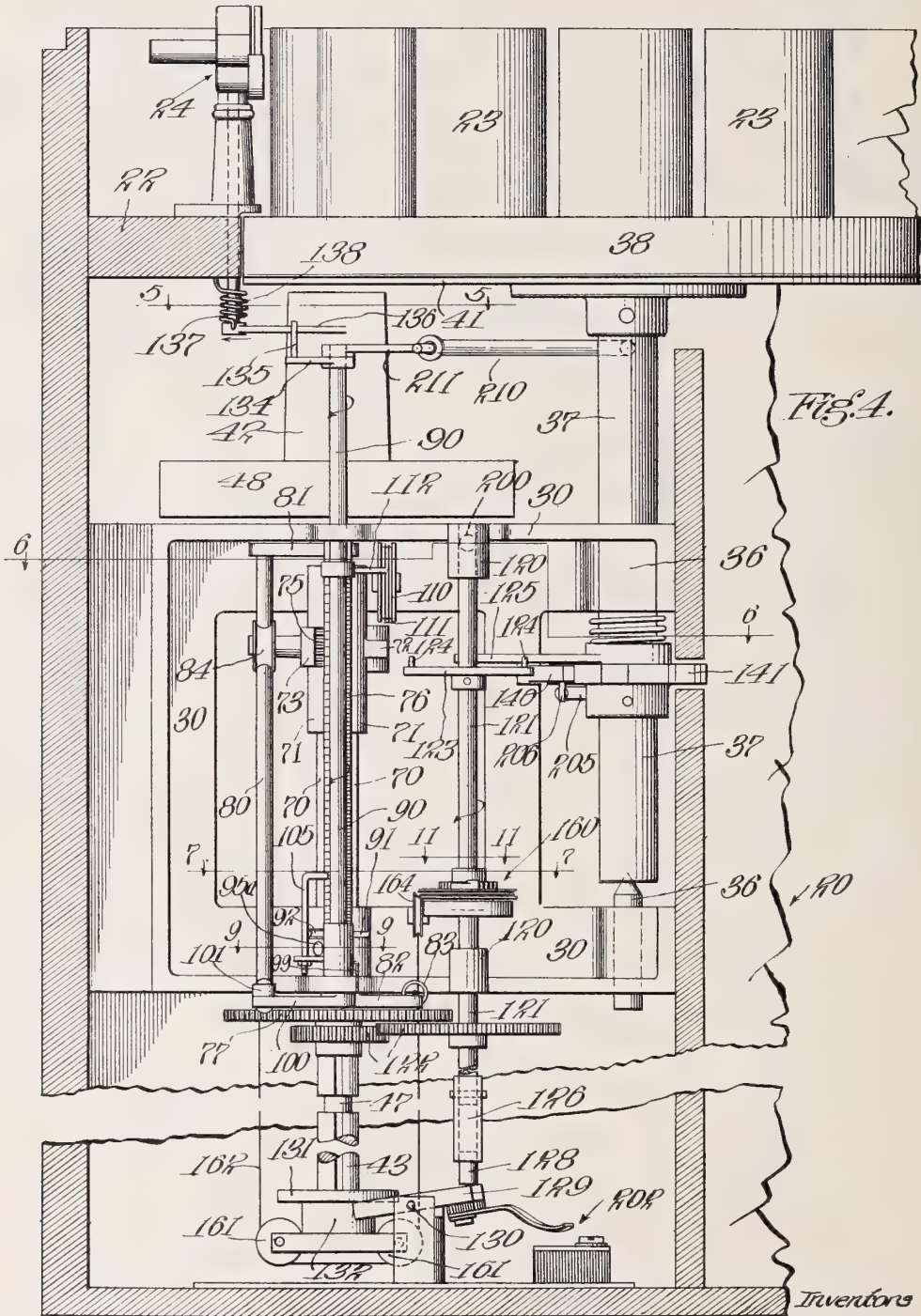


FIG. 4.

Witnesses  
B. M. Woodie  
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H. T. SCOTT & L. J. PATTERSON.

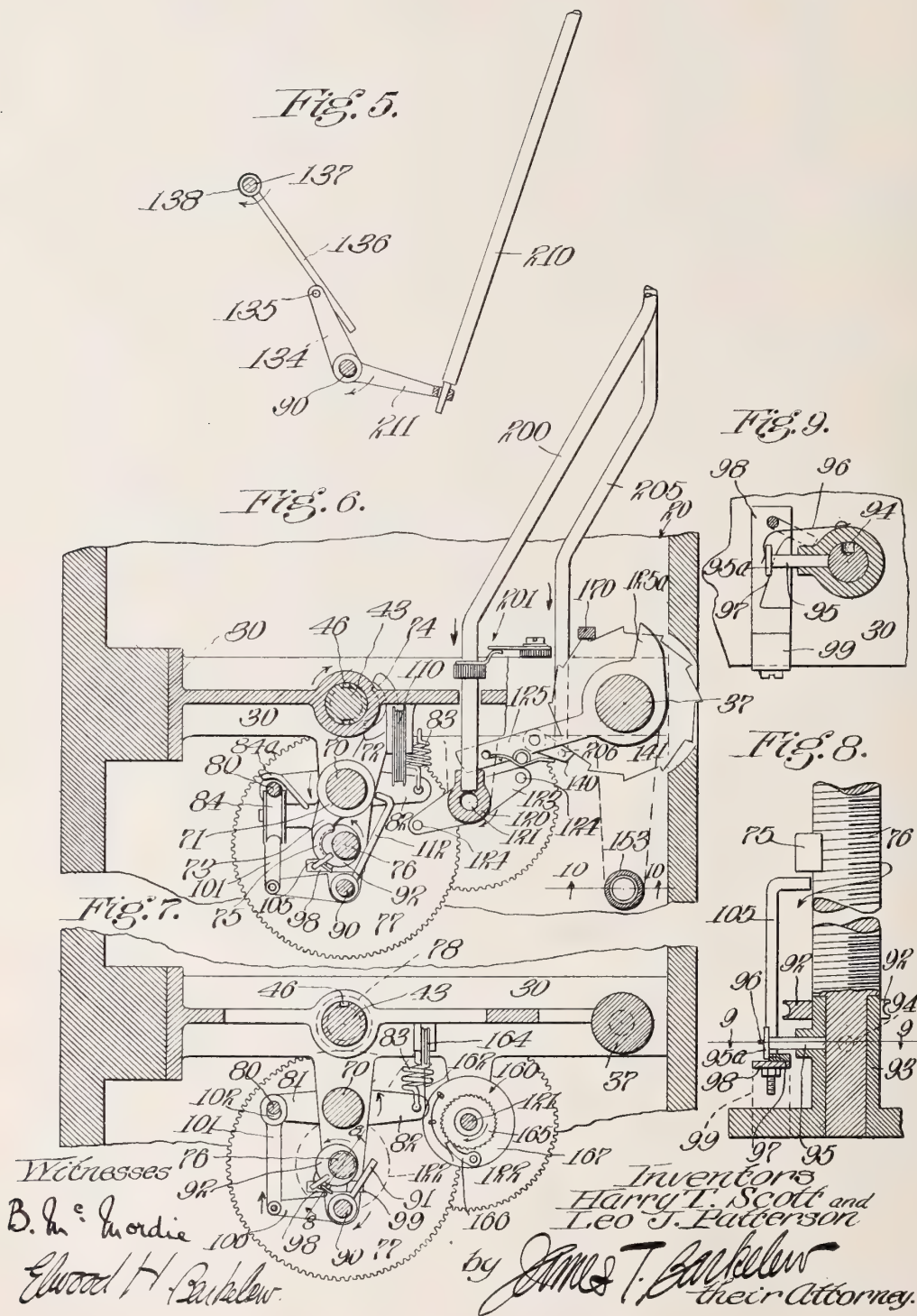
AUTOMATIC PHONOGRAPH.

APPLICATION FILED MAY 27, 1911.

1,040,029.

Patented Oct. 1, 1912.

6 SHEETS-SHEET 4.







H. T. SCOTT & L. J. PATTERSON.

AUTOMATIC PHONOGRAPH.

APPLICATION FILED MAY 27, 1911.

1,040,029.

Patented Oct. 1, 1912.

6 SHEETS—SHEET 5.

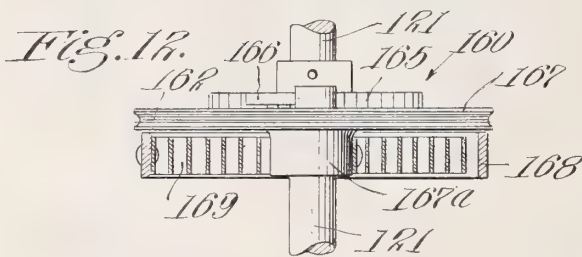
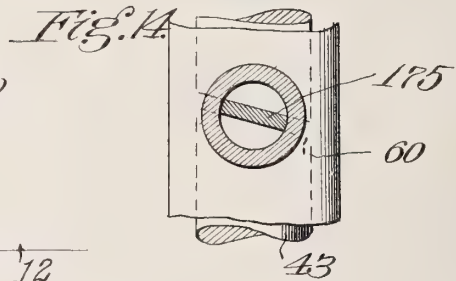
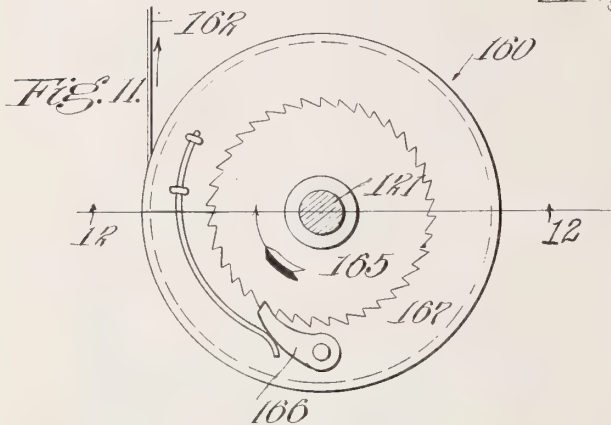
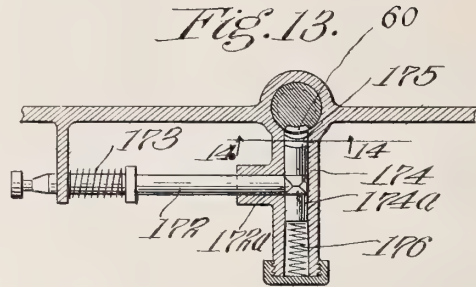
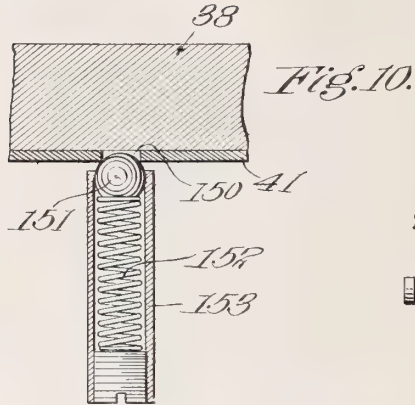
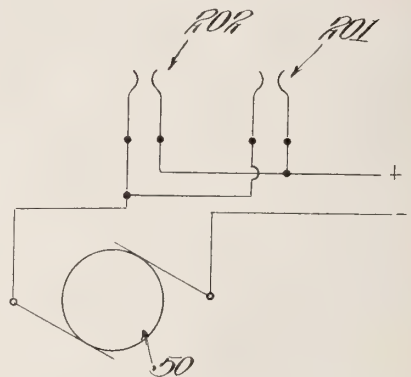


Fig. 15.



Witnesses

B. M. Mordie  
Edward H. Barken

Inventors

Harry T. Scott and  
Leo J. Patterson

by James T. Barken  
their attorney.



H. T. SCOTT & L. J. PATTERSON.

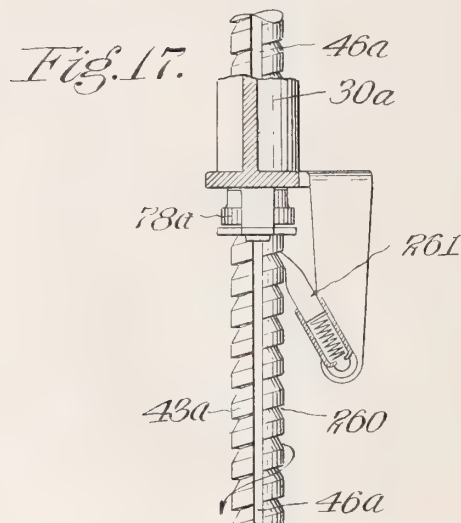
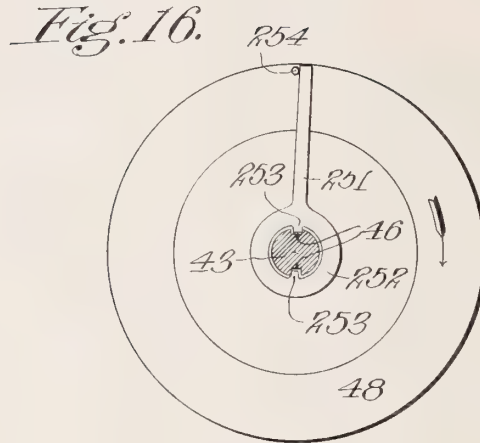
AUTOMATIC PHONOGRAPH.

APPLICATION FILED MAY 27, 1911.

1,040,029.

Patented Oct. 1, 1912.

6 SHEETS—SHEET 6.



*Witnesses*  
B. M. Mordie  
Wood H. Enkelu

*Inventors*  
Harry T. Scott and  
Leo J. Patterson  
by James T. Backe  
their Attorney.

# UNITED STATES PATENT OFFICE.

HARRY T. SCOTT AND LEO J. PATTERSON, OF LOS ANGELES, CALIFORNIA; SAID PATTERSON ASSIGNOR TO SAID SCOTT.

## AUTOMATIC PHONOGRAPH.

1,040,029.

Specification of Letters Patent.

Patented Oct. 1, 1912.

Application filed May 27, 1911. Serial No. 629,892.

*To all whom it may concern:*

Be it known that we, HARRY T. SCOTT and LEO J. PATTERSON, citizens of the United States, both residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Automatic Phonographs, of which the following is a specification.

This invention relates to an automatic phonograph for playing automatically and successively a number of phonograph records of the ordinary cylindrical, or Edison, type; and the invention consists primarily in an arrangement of mechanisms whereby the records are carried with their axes in vertical positions and are elevated from the carrying member or table to a position adjacent the reproducing mechanism, which reproducing mechanism is located above the table at a convenient position to engage the records when they are raised.

In its specific preferred embodiment our invention consists of a rotating table mounted on a vertical axis, the table having pockets arranged around its periphery and in which the cylindrical records are adapted to rest. The pockets extend through the table, the records resting on annular shelves around the lower edges of the pockets, so that there is an opening under each pocket through which the record raising member and record engaging mandrel may pass. The table is provided with an intermittent rotating mechanism so that it may be moved to place successive records over the record engaging mandrel. The mandrel is mounted on the upper end of a vertically movable and rotatable shaft, the action of the shaft being first to move vertically and engage the mandrel with the record immediately above, move the record to a point adjacent the reproducing mechanism, and then to rotate and slowly move downwardly in a manner designed to keep the sound groove of the record in engagement with the reproducing needle. In other words, the record is both rotated and moved longitudinally—given two distinct movements—instead of, as heretofore, rotating the record and moving the reproducing mechanism longitudinally along the record. In our machine the reproducing mechanism is held stationary, at least so far as movement along the record is concerned. When the record carrying mandrel has moved downwardly to

a point where the reproduction of the record is completed, the mechanism allows the mandrel to move quickly to its lowermost position. In doing this, the record is left in its pocket on the table. Immediately the mandrel has reached its lowermost position and is free of the table, the table is rotated through a certain portion of a revolution to bring the next record directly over the mandrel. When this has been accomplished the mandrel is again automatically started upward and the whole operation repeated.

We will show in the accompanying drawings our present preferred form of apparatus; but it will be understood that there are certain variations which we may make, and we have shown some of these variations, notably a modified form of controlling the downward movement of the mandrel. These features will be best understood from the following specification taken in connection with the accompanying drawings, in which:

Figure 1 is a plan view of our mechanism as arranged within a case, the cover being removed. Fig. 2 is a section of the same taken as from line 2—2 on Fig. 1 with the cover in place. Fig. 3 is an enlarged vertical section and elevation taken on line 3—3 of Fig. 1. Fig. 4 is an enlarged vertical section and elevation taken on line 4—4 of Fig. 1. Fig. 5 is a horizontal section taken on line 5—5 of Fig. 4. Fig. 6 is a horizontal section taken on line 6—6 of Fig. 4. Fig. 7 is a horizontal section taken on line 7—7 of Fig. 4. Fig. 8 is an enlarged detail section taken on line 8—8 of Fig. 7. Fig. 9 is a cross section taken on line 9—9 of Figs. 4 and 8. Fig. 10 is a cross section taken on line 10—10 of Fig. 6. Fig. 11 is an enlarged section taken on line 11—11 of Fig. 4. Fig. 12 is a section taken on line 12—12 of Fig. 11. Fig. 13 is an enlarged section taken on line 13—13 of Fig. 3. Fig. 14 is a further enlarged section taken on line 14—14 of Fig. 13. Fig. 15 is a diagram showing the electrical control of the motor. Fig. 16 is a section taken on line 16—16 of Fig. 3 and showing the means of driving the mandrel shaft from the fly-wheel. Fig. 17 is a view taken as indicated by line 17—17 on Fig. 3, but illustrating a modified form of mechanism for lowering the mandrel shaft.

In the accompanying drawings we have shown our mechanism housed within a case 20 provided with a cover 21. Case 20 is



provided with a horizontal shelf 22 at a distance below its upper edge measured more or less approximately by the length of records 23, and reproducing mechanism 24 is secured on and above this shelf. We have shown a special form of horn which leads with a tapering arm 25 from the reproducing mechanism back and upwardly toward the rear edge of cover 21, the horn 26 curving laterally and forwardly and opening at the front of the cover. The horn lies wholly above the tops of records 23 so that the movement of the records is not interfered with in any particular. This arrangement of the horn in the cover of the case is most convenient with our present arrangement on account of the arrangement of all the operating mechanism below shelf 22.

Below shelf 22 the case is divided into two main compartments and in one of the compartments the operating mechanism is located. A suitable frame 30 is secured to the case in any desired manner, it being preferable to secure it so that any vibrations generated in the moving mechanisms will not be transmitted to the case. Near one end the frame is provided with bearings 36 which carry table shaft 37. On the upper end on table shaft 37 is mounted a circular flat table 38 provided with a series of pockets 39 arranged around its circumference. Pockets 39 extend vertically through the table and records 23 rest at their lower edges on an annular shelf 40 which is formed by a plate 41 secured to the under side of the table. The apertures in plate 41 are of sufficient diameter to pass mandrel 42, which mandrel is made to engageably fit within the records. Mandrel 42 is mounted on the upper end of mandrel shaft 43 which extends down through bearings 44 and 45 in frame 30. Mandrel shaft 43 is of considerable length and projects below frame 30 for some distance. It is provided with longitudinal key-ways 46 reaching from near its upper end to an annular groove 47 cut at a point somewhat below its center. In the upper part of frame 30 a fly-wheel 48 is provided with a bearing and this fly-wheel is keyed to the shaft so as to revolve therewith but to allow vertical movement of the shaft without moving the fly-wheel vertically. Our special means for effecting this connection of the fly-wheel to the shaft will be considered later. This fly-wheel is also the driving wheel of the apparatus, the driving being done through the medium of a belt or other member 49 which connects with a motor 50 placed in the bottom of the case. The control of motor 50 will be hereinafter explained. Below fly-wheel 48 and leading down to a point near groove 47 a helical groove or screw thread 60 is cut in mandrel shaft 43, this groove being preferably of the same depth as key-ways 46. Mandrel shaft

43 revolves in the direction indicated, right handed looking down on the top, and helical groove 60 is cut so that, when engaged by a stationary member, it will cause the shaft to rise by virtue of its own rotation. The means for engaging the groove will be explained hereinafter, together with its connection and actuation with other parts of the mechanism.

Located in bearings in frame 30 alongside and parallel to mandrel shaft 43 is a vertical guide column 70 on which a sleeve 71 is adapted to move. Sleeve 71 carries two horizontally projecting arms 72 and 73, arm 72 carrying a segmental lug 74 adapted to engage in annular groove 47 of mandrel shaft 43, and arm 73 carrying a half nut 75 screw threaded to engage with the screw threads on feed shaft 76. Feed shaft 76 stands vertically in frame 30 and is rotated in the direction indicated by means of gear connections 77 and 78 with mandrel shaft 43. Sleeve 71 is rotatively connected to column 70 but is slidable thereon through the medium of a novel arrangement which we have evolved for this particular situation. We have found that the use of a key and slot creates so much friction that considerable force is necessary to draw sleeve 71 to the position shown in the drawings after it has been fed down to its lowermost position. We have therefore adopted a mechanism comprising a vertical rod 80 which is supported between two horizontal arms 81 rigidly connected with column 70 at its top and bottom. Lower arm 81 is provided with an extension 82, and a spring 83 connected between the end of extension 82 and frame 30 tends to pull column 70 and rod 80 around in the direction indicated. Sleeve 71 carries a small wheel 84 which rotates on rod 80 so that the sleeve is rotated to throw lug 74 and nut 75 into engagement with mandrel shaft 43 and feed shaft 76. The operation of these parts is effected by a trip mechanism shown in Figs. 6 and 7 and partly in detail in Figs. 8 and 9. A trip shaft 90 is vertically mounted in the frame and carries on its lower end a radially projecting rod 91 which is, in effect, a cam follower for cam 92. Cam 92 is mounted on a sleeve 93 loosely surrounding the lower end of feed shaft 76 and normally does not revolve therewith. The feed shaft is provided with an aperture 94 and a small spring pressed pin 95 is adapted to enter the aperture when it is released to be pressed inwardly by its spring 96. But it is normally held outwardly by riding over an eccentric shoulder 97 on a small spring supported member 98. Member 98 is supported by a spring 99 from frame 30 in such a manner that it may be pressed downwardly and shoulder 97 pressed out of engagement with head 95<sup>a</sup> of pin 95. Immediately member 98 is

pressed downwardly pin 95 is free to be pressed into aperture 94 when the aperture comes beneath the end of the pin in the course of the rotation of feed shaft 76.

5 Cam 92 is then rotated with the feed shaft and follower 91 is pushed away in the direction indicated. This rotates trip shaft 90 in the direction indicated and causes the movement of an arm 100 mounted on the

10 lower end of the trip shaft. Arm 100 is connected by a rod 101 with rod 80, but a slot 102 is made in rod 101 around rod 80 so as to allow a certain amount of movement of shaft 90 before rod 80 is moved. The

15 downward movement of member 98 is caused by nut 75 coming into contact with adjustable member 105 when the nut reaches the lowermost portion of its downward movement. It thus sets in action the mechanism

20 just described and shaft 90 is first rotated in the direction indicated to throw the reproducer point away from the record whose reproduction has just been finished (this action will be explained later) and then arm

25 81 and guide column 70 are moved in the direction opposite to that indicated. This movement of the guide column and of rod 80 allows sleeve 71 to rotate so as to disengage nut 75 from feed shaft 76 and at the

30 same time to disengage segmental lug 74 from groove 47 in mandrel shaft 43. When this is done the sleeve 71 with its connected parts is immediately pulled upwardly to the position shown in Fig 4 by the action of

35 a small spring operated reel 110. This spring operated reel is of ordinary construction and it is thought unnecessary to show its details, it merely imposing a tension on a wire or other flexible connecting member

40 111 which is secured to the sleeve 71 or to one of its attached parts, the upward pull being sufficient to raise the sleeve to the position illustrated. When the sleeve reaches its upward position it passes under the end

45 of a finger 112, shown in Figs. 4 and 6, and holds trip shaft 90 in the position shown in Figs. 6 and 7. In this position of the trip shaft the reproducer point is held away from the records; the reproducer point is consequently not let into engagement with the

50 record until sleeve 70 has again begun its slow downward screw fed motion to the extent of passing away from the end of finger 112.

55 Trip shaft 90 projects above frame 30 and carries on its upper end a small arm 134 having an upwardly projecting pin 135. Pin 135 is engaged by an arm 136 projecting radially from the lower end of reproducer shaft 137. The reproducer shaft has a constant tendency to rotate in the direction indicated under the influence of a spring 138, and this tendency unimpeded will throw the

60 reproducer point into engagement with a record carried by the mandrel. Spring 138 also

tends to rotate shaft 90 in the direction opposite to that indicated and to consequently throw follower 91 up against cam 92; but it is prevented from throwing the follower to its ultimate position by finger 112 bearing against sleeve 71, as shown in Fig. 6. In this position the reproducer point is away from the record, and the point remains in this position at all times except when the record is being reproduced and is being rotated and fed slowly downwardly by the action of feed screw 76.

We will now explain the mechanism by which the mandrel shaft is lowered and by which the record carrying table is intermittently rotated. Mounted in bearings 120 on frame 30 is a counter shaft 121 which has gear connections 122 with feed shaft 76. The ratio of reduction between feed shaft 76 and counter shaft 121 may be anything desired; we have shown it about one to two. Shaft 121 is rotated in the direction indicated and carries near its upper end a double arm 123 having pins 124 which are adapted to engage with ratchet arm 125 when shaft 121 is raised to the position shown in Fig. 4. The normal position of shaft 121 is a position lowered from that illustrated in Fig. 4 to such an extent that pin 124 will revolve beneath arm 125 without engaging with it. Shaft 121 projects below lower bearing 120 and its end is slidably but rotatively engaged in a sleeve 126. Sleeve 126 contains a spring 127 which presses upwardly on shaft 121, and a stud 128 rigidly secured in the lower end of the sleeve is adapted to be lifted by engagement with the end of a lever 129 pivoted at 130 and having its other end adapted to be pressed downwardly by a collar 131 which forms a portion of a step bearing 132 under the lower end of mandrel shaft 43. When the mandrel shaft reaches its lowermost position this flange operates lever 129 to move stud 128 and sleeve 126 upwardly, and also, normally, to move shaft 121 upwardly so that one of pins 124 will engage with ratchet arm 125 during their rotation. But, should it happen that this operation takes place when one of pins 124 is beneath arm 125, spring 127 will press and allow shaft 121 to remain down until the pin passes out from beneath arm 125. The other pin will then engage the arm as it rotates.

Ratchet arm 125 is pivoted around table shaft 37 and carries pawl 140 adapted to engage with the teeth of ratchet 141. Ratchet 141 is rigidly set on shaft 37; and the different parts are so arranged and proportioned that the movement imparted to arm 125 by engagement with one of pins 124 is sufficient to rotate the ratchet through an angular distance equal to the angular distance between the records on the table above (in



this case one-twelfth of the revolution). Means are provided for holding the table accurately in position at the end of its movement, this means comprising a series of  
 5 apertures 150 cut in its under surface and adapted to be engaged by a ball 151 pressed upwardly by a spring 152 carried in a tube 153. Tube 153 is supported from the frame in any desired manner and is so placed that  
 10 the entry of ball 151 into one of apertures 150 will stop the table accurately in position with one of records 23 directly above mandrel 42; yet not so much resistance to rotation is imposed that it is impossible for the  
 15 ratchet mechanism to easily rotate the table from one position to the next.

A means of controlling the downward movement of mandrel shaft 43 is comprised in a small ratchet device 160 mounted on  
 20 shaft 121. Step bearing 132 at the lower end of mandrel shaft 43 carries a pair of small pulleys 161 over which a cord or other flexible member 162 passes. Cord 162 is secured at one end, as at 163, to frame 30 and  
 25 passes upwardly at its other end from pulleys 161 to and over a small pulley 164 and thence to ratchet mechanism 160. The ratchet mechanism, shown in detail in Figs. 11 and 12, comprises a ratchet wheel 165  
 30 rigidly attached to shaft 121 and engageable by a small spring pressed pawl 166. Pawl 166 is set on a wheel 167 over which flexible member 162 winds up. Below wheel 167 a stationary frame 168 is placed and one end  
 35 of a spiral spring 169 is secured to this frame, the other end of the spring being secured to hub 167<sup>a</sup> of wheel 167. Wheel 167 is loosely mounted on shaft 127 and does not normally rotate therewith. When the mandrel shaft is lowering and wheel 167 is being  
 40 rotated in the direction indicated by reason of the movement of flexible member 162, the spring 169 is being wound up; and when the mandrel shaft is raised the spring  
 45 will then rotate wheel 167 in the opposite direction and take up the slack in flexible member 162. Wheel 167 may rotate in the direction opposite to that indicated as fast as desired; but when it rotates in the direction  
 50 indicated it will be seen that pawl 166 engaging with ratchet 165 will prevent the wheel from rotating faster than shaft 121 if rotating in the same direction. Thus mandrel shaft 43 can only be lowered as fast as  
 55 flexible member 162 is let out when wheel 167 is traveling at the same speed of rotation as shaft 121; and this speed is so adjusted that the mandrel shaft is let down quickly but without any shock to the mechanism.

60 We will now explain the general operation of the mechanism described, leaving the explanation of the manual control of the machine to be set forth later. In the drawings the machine is shown in the position in which it will be stopped (the mecha-

nism for causing its stoppage always in this position will be later explained). Starting with the machine in this position and supposing the rotation of mandrel shaft  
 70 43 to commence and supposing the rotation of the other parts to be as described, it will be seen that one of pins 124 will immediately engage with arm 125 and cause the rotation of the record carrying table 38 to  
 75 its next position. Mounted on arm 125 and projecting on the opposite side of shaft 37 therefrom is a projection 125<sup>a</sup> which will engage with a small lever 170 at the end of its movement, or just as table 38 is coming  
 80 into position. Lever 170 is pivoted at 171 on the frame and its other end engages the end of a sliding rod 172. Rod 172 is pressed in the direction indicated by a spring 173 and is moved against the pressure  
 85 of the spring by the action of lever 170. Rod 172 is pointed on its end as at 172<sup>a</sup> (shown in Fig. 13) and this pointed end is adapted to engage with a similarly shaped groove 174<sup>a</sup> in plunger 174. Plunger  
 90 174 is provided on one end with a segmental lug 175 which is adapted to engage with screw thread groove 60 in mandrel shaft 43, and is pressed into engagement by a spring 176. When the parts are into  
 95 position shown in Fig. 13, lug 175 is kept out of engagement with the screw thread groove, but when rod 172 is moved to the left the lug 175 is pressed into engagement with the mandrel thread by spring 176.  
 100 The rotation of the mandrel shaft then causes it to rise until the end of thread 60 comes to lug 175, and the lug and plunger 174 are pressed outwardly by the rising end of the thread until the end of rod 172  
 105 again will engage in groove 174<sup>a</sup>, when spring 173 will force rod 172 to the right and thus force plunger 174 out against the action of spring 176. But when this takes place the segmental lug 74 on arm 72 carried by sleeve 71 drops into annular groove  
 110 47, the parts being so proportioned that groove 47 reaches a position under lug 74 just as the end of screw thread 60 reaches a position under lug 175. The mandrel shaft is then at its uppermost point and has been  
 115 raised sufficiently to pass mandrel 42 into a record 23 and to raise the record so that its lower end is opposite reproducer point 24<sup>a</sup>. The reproducer point is still held out of engagement with the record for the reason  
 120 that sleeve 71 is still beneath the end of finger 112. When lug 74 moves into groove 47, nut 73 engages with screw thread feed shaft 76. The threads on feed shaft 76 are so cut that the rotation of the shaft immediately tends to feed the nut 73 and sleeve 71 downwardly. The mandrel shaft,  
 125 mandrel and record, are thus fed downwardly as fast as sleeve 71 is fed downwardly; and the speed of downward feed is  
 130

so arranged with relation to the rotation of the mandrel shaft that the record is fed downwardly at the exact speed required to keep the reproducing point in engagement with the sound groove. A small amount of downward movement of sleeve 71 suffices to move the sleeve away from the end of finger 112, and spring 138 then immediately moves reproducer shaft 137 in the direction indicated and moves reproducer 24 in the direction indicated (in Fig. 1) and moves the reproducer point into engagement with the record and the sound groove thereon. The reproduction of the record immediately begins and continues as long as the mandrel is rotated and is fed slowly downwardly by the action of feed screw 76. The different parts of the mechanism are so arranged and proportioned that, when the record has been fed downwardly to a point where its whole sound groove has been traversed by the reproducing needle, then nut 73 engages with member 105 of the trip mechanism and causes the operation of the trip mechanism as hereinbefore set forth. The operation of the trip mechanism causes the rotation on trip shaft 90 in the direction indicated and causes, first, the movement of the reproducer to remove the reproducing point from engagement with the record, and second, causes the movement of rod 80 and allows nut 75 to disengage from feed shaft 76 and allows segmental lug 74 to disengage from groove 47 in mandrel shaft 43. Sleeve 71 being thus released is immediately pulled to its uppermost position where it remains until the next operation of the machine. The mandrel shaft, being now unsupported from the feed shaft, falls as fast as is allowed by ratchet mechanism 160. As it moves downwardly, the record 23, which has been held by mandrel 42, is again left in position on table 38, the mandrel moving on downwardly to the position shown in Fig. 3. When the mandrel and mandrel shaft reach their lowermost positions, counter shaft 121 is moved upwardly, as hereinbefore described, and the movement of table 38 to place the next record over the mandrel takes place. At the same time, or at the end of this movement, the mechanism shown in Fig. 13 is operated and allows lug 175 to engage with the screw thread in mandrel shaft 43, causing the mandrel shaft to rise and the mandrel to engage with the next record. The foregoing described operation is thus repeated; and it will be repeated and the records played successively just so long as the mandrel shaft is rotated—or, in other words, in the present arrangement, as long as current is supplied to motor 50.

For the manual control of the machine we have provided means for starting and stopping the operation, means for repeating a

record as many times as desired, and means for discontinuing the reproduction of any record and going on to the successive record. For starting and stopping the machine we have provided a control rod 200 which enters bearing 120 above the upper end of counter shaft 121. Control rod 200 may be moved in the direction indicated so that its end will then project over the upper end of shaft 121 and prevent that shaft from being raised to the position shown in Figs. 3 and 4. This will prevent the feeding of the table when mandrel shaft 43 reaches its lowermost position. A switch 201 is mounted on rod 200 and on frame 30 and is normally closed when rod 200 is in the position shown—its outward position. Switch 201 controls the supply of current to motor 50, as is shown in Fig. 15, so that when rod 200 is out and will allow the raising of shaft 121, current is supplied to the motor and the whole mechanism is operated. When rod 200 is pressed inwardly the switch 201 is opened; and if this switch solely controlled the motor then the machine would stop whenever rod 200 was pressed inwardly. But it is desirable to have the arrangement such that the machine will go on operating until the mandrel reaches its lowermost position, leaving all the records standing on the table and thus obviating any liability of breakage of records or of the machine. We have provided for this by installing a second switch 202 which is mounted, for instance, on lever 129 and on the case in such a manner that ordinarily the switch 202 will be closed, but when lever 129 is moved by the mandrel shaft the switch will be open. This position of the switch is shown in Fig. 4. Switch 202 is arranged in multiple with switch 201, as is shown in Fig. 15; and it will thus be seen that, should switch 201 be opened with the mandrel at any point above its lowermost position, current will be continuously supplied to the motor through switch 202 until the mandrel shall reach its lowermost position and open switch 202. But when the mandrel reaches this position and tends to raise shaft 121, the shaft is prevented from being raised by the previous operation of control rod 200. The whole operation of the machine is thus stopped with the parts in the position shown in Figs. 3 and 4.

For continuing to play any desired record we have provided another control rod 205 which projects into the machine and is adapted to engage a pin 206 mounted on pawl 140. By pressing inwardly on rod 205 (all the control rods being provided with operating buttons or the like on their outer ends outside the case) the pawl 140 is raised so that it will not engage with the teeth of ratchet 141. Ratchet arm 125 may then oscillate without moving the record carrying



table, and the next upward movement of the mandrel will pick up the record which has just been replaced on the table. The parts are so arranged that there is sufficient friction to keep rod 205 in either the position shown or in its position pressed inwardly; so that, by pressing the rod inwardly, the same record will be repeated until the rod is pulled out again.

For discontinuing the play of any record we have provided a third control rod 210 which engages with its end an arm 211 mounted on trip shaft 90. Through the medium of this arm 210 trip shaft 90 may be rotated in the direction indicated, and this rotation will effect the same results as the rotation by the trip mechanism hereinbefore explained; namely, to first turn the reproducer to disengage the reproducer point from the record and then to disengage nut 75 and segmental lug 74 from the feed shaft and mandrel shaft respectively, allowing sleeve 71 to rise to its uppermost position and allowing the mandrel shaft to drop. This immediately replaces the record on the table, and when the mandrel shaft reaches its lowermost position the various mechanisms are actuated to feed the table around and to again lift the mandrel to pick up the next record.

We have found that the ordinary method of connecting fly-wheel 48 to mandrel shaft 43, by means of a key and key-way, is productive of a certain amount of loose movement and knocking. We have consequently evolved a novel form of connection for use in our mechanism which obviates all noise. This is best shown in Figs. 3 and 16. The fly-wheel runs on an internal bearing on a sleeve 250 and has no direct connection with the mandrel shaft. On top of the fly-wheel is placed a radially extending bar 251 having a ring portion 252 loosely surrounding the mandrel shaft. This bar has two lugs or keys 253 which engage loosely with keyways 46 in the mandrel shaft; and the outer end of the bar engages a pin 254 set in the edge of the fly-wheel and as nearly over the point of belt pull as possible. By so placing the pin 254 the pressure imposed by the fly-wheel on its bearing is minimized (considering the fly-wheel as a lever fulcrumed at pin 254 with the power applied by the belt 49 and the work done by pressure exerted on bearing sleeve 250).

In Fig. 17 we have shown a modified form of mechanism for lowering the mandrel shaft, taking the place of the mechanism shown in Figs. 11 and 12. For this purpose the lower end of the shaft is provided with screw threads 260 of V-shaped section with a square surface on the upper side. A detent 261, spring cushioned, is hung from frame 30<sup>a</sup> so as to fall into the threads and prevent the shaft from lowering faster than by vir-

tue of its rotary motion in the direction indicated. But when the shaft is rotating and is stationary longitudinally, or is moving upwardly, or is moving downwardly, more slowly than threads 261 would lower the shaft by their action; then the threads will appear to move upwardly under the end of the detent and the detent will merely be raised on the inclined surface of the threads and drop over the square surfaces. When the shaft is released it will drop until the detent catches in the thread portion immediately above, when the shaft will screw itself down to its lowermost position.

Having described our invention, we claim—

1. A device of the character described, comprising a record support, a record carrier rotatable about and movable along a longitudinal axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a movable reproducer mechanism into proximity with which a record is moved by the longitudinal movement of the record carrier, a feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved longitudinally by the rotation of the feed screw, and a mechanism controlled by the longitudinal position of the feed member and adapted to both disengage the feed member with the feed screw and the carrier and to move the reproducer mechanism relatively to a record carried by the carrier.

2. A device of the character described, comprising a record support, a record carrier rotatable about and movable along a longitudinal vertical axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a reproducer mechanism into proximity with which the record is moved by the longitudinal movement of the carrier, a vertical feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved downwardly by the rotation of the feed screw, a mechanism controlled by the position of the feed member and adapted to disengage the feed member from the feed screw and the carrier and to move the reproducer mechanism out of engagement with the record on the carrier, and means to move the feed member upwardly when disengaged from the feed screw and the carrier.

3. A device of the character described, comprising a record support, a reproducer mechanism, a record carrier rotatable about and movable along a longitudinal axis, means for rotating the carrier, means for

causing the longitudinal movement of the carrier by virtue of its own rotation, the carrier in its longitudinal movement being adapted to engage and carry a record to a point near the reproducer mechanism, a feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved longitudinally by the rotation of the feed screw, a mechanism controlled by the position of the feed member and adapted to disengage the feed member with the feed screw and the carrier and to move the reproducer mechanism relatively to the record, and mechanism controlled by the position of the carrier to intermittently move the record support.

4. A device of the character described, comprising a movable record support, a record carrier rotatable about and movable along a longitudinal vertical axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved downwardly by the rotation of the feed screw, a movable reproducer mechanism into proximity with which a record is moved by the vertical movement of the carrier, mechanism controlled by the position of the feed member and adapted to disengage the feed member with the feed screw and the carrier and adapted to move the reproducer to disengage the record on the carrier, means for moving the feed member upwardly when disengaged from the feed screw and the carrier, and mechanism controlled by the position of the carrier and adapted to intermittently move the movable record support.

5. A device of the character described, comprising a record support, a record carrier rotatable about and movable along a longitudinal axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a feed screw arranged parallel to the carrier, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved longitudinally, mechanism for disengaging the feed member controlled by the longitudinal position of said member, mechanism for controlling the means for causing a longitudinal movement of the carrier and controlled by the longitudinal position of the carrier, and mechanism controlled by the rotation of the carrier for controlling the movement of the carrier to one of its extreme positions.

6. A device of the character described, comprising a record support, a record carrier rotatable about and movable along a

longitudinal vertical axis, means for rotating the carrier, a vertical feed screw arranged parallel to the carrier, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved downwardly by the rotation of the feed screw, mechanism for disengaging the feed member and controlled by the longitudinal position of said member, means for moving the feed member upwardly when disengaged from the feed screw, and mechanism controlled by the rotation of the carrier for controlling the downward movement of the carrier to its lowermost position.

7. A device of the character described, comprising a movable record support, a record carrier rotatable about and movable along a longitudinal vertical axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a vertical feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved downwardly by the rotation of the feed screw, mechanism for disengaging the feed member from the feed screw and the carrier and controlled by the longitudinal position of the feed member, means for moving the feed member upwardly when disengaged from the feed screw and carrier, mechanism controlled by the position of the carrier for intermittently operating the movable record support, and mechanism controlled by the rotation of the carrier for controlling the downward movement of the carrier to its lowermost position.

8. A device of the character described, comprising a record support, a record carrier rotatable about and movable along a longitudinal vertical axis, means for rotating the carrier, means for causing the longitudinal upward movement of the carrier by virtue of its own rotation, a reproducer mechanism into proximity with which the record of the carrier is moved by the longitudinal movement of the carrier, a vertical feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw with the carrier to be moved downwardly by the rotation of the carrier, a mechanism controlled by the position of the feed member and adapted to disengage the feed member from the feed screw and the carrier and to move the reproducer mechanism relatively to the record on the carrier, means to move the feed member upwardly when disengaged from the feed screw and the carrier, and mechanism controlled by the rotation of the carrier, for controlling the downward movement of the carrier to its lowermost position.

9. A device of the character described,



comprising a movable record support, a record carrier rotatable about and movable along a longitudinal vertical axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved downwardly by the rotation of the feed screw, a movable reproducer mechanism into proximity with which a record is moved by the vertical movement of the carrier, mechanism controlled by the position of the feed member and adapted to disengage the feed member from the feed screw and the carrier and adapted to move the reproducer to disengage the record on the carrier, means for moving the feed member upwardly when disengaged from the feed screw and the carrier, mechanism controlled by the position of the carrier and adapted to intermittently move the movable record support, and mechanism controlled by the rotation of the carrier for controlling the downward movement of the carrier to its lowermost position.

10. In a device of the character described, a record carrier rotatable about and movable along a longitudinal axis, an electric motor rotatively connected to the carrier, means for causing the longitudinal movement of the carrier, and switch control means for the motor comprising a manually operable switch and a switch controlled by the position of the carrier, the switches being in parallel with each other and in series with the motor.

11. In a device of the character described, a record support, a record carrier rotatable about and movable along a longitudinal axis to engage a record on the support, an electric motor rotatively connected to the carrier, means for causing the longitudinal movement of the carrier, and switch control means for the motor comprising a manually operable switch and a switch controlled by the position of the carrier, the switches being in parallel with each other and in series with the motor.

12. In a device of the character described, a record carrier rotatable about and movable along a longitudinal vertical axis, an electric motor rotatively connected to the carrier, means for causing the longitudinal movement of the carrier, and switch control means for the motor, comprising a manually operable switch and a switch controlled by the position of the carrier, the switches being in parallel with each other and in series with the motor, and the carrier controlled switch being normally closed and adapted to be opened by the carrier when at its lowermost position.

13. In a device of the character described, a record support, a record carrier rotatable about and movable along a longitudinal axis to engage and remove a record from the support, an electric motor rotatively connected to the carrier, means for causing the longitudinal movement of the carrier, and switch control means for the motor comprising a switch controlled by the position of the carrier, the switch being normally closed and adapted to be opened by the carrier when in position to not engage a record.

14. A device of the character described, comprising a record support, a record carrier rotatable about and movable along a longitudinal vertical axis, means for rotating the carrier, a vertical feed screw arranged parallel to the carrier, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved downwardly by the rotation of the feed screw, mechanism for disengaging the feed member from the feed screw and carrier and controlled by the longitudinal position of said member, means for moving the feed member upwardly when disengaged from the feed screw, an electric motor rotatively connected to the carrier, and switch control means for the motor comprising a manually operable switch and a switch controlled by the carrier, the switches being in parallel with each other and in series with the motor, the carrier controlled switch being normally closed and being adapted to be opened by the carrier when in its lowermost position.

15. A device of the character described, comprising a record support, a record reproducer mechanism, a record carrier rotatable about and movable along a longitudinal axis, means for rotating the carrier, means for causing the movement of the carrier longitudinally to engage a record on the support and move it into proximity to the reproducer mechanism, means controlled by the position of the carrier to move the reproducer into engagement with the record carried by the carrier, and manually operable means for moving the reproducer.

16. A device of the character described, comprising a record support, a record carrier rotatable about and movable along a longitudinal axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a feed screw arranged parallel to the carrier, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved longitudinally, mechanism for disengaging the feed member from the feed screw and carrier and controlled by the longitudinal position of said member, and mechanism for controlling the means for causing a longitudinal movement of the carrier and controlled by the longitudinal position of the carrier, and manu-

ally operable means for controlling the mechanism normally controlled by the position of the feed member.

17. A device of the character described, comprising a record support, a record carrier rotatable about and movable along a longitudinal axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a movable reproducer mechanism into proximity with which a record is moved by the longitudinal movement of the record carrier, a feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved longitudinally by the rotation of the feed screw, a mechanism controlled by the longitudinal position of the feed member and adapted to both disengage the feed member from the feed screw and the carrier and to move the reproducer mechanism out of engagement with a record carried by the carrier, and manually operable means for controlling the mechanism normally controlled by the position of the feed member.

18. A device of the character described, comprising a movable record support, a record carrier rotatable about and movable along a longitudinal axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved longitudinally by the rotation of the feed screw, mechanism for disengaging the feed member controlled by the longitudinal position of said member, mechanism controlled by the position of the carrier to operate the movable record support, manually operable means for controlling the operation of the mechanism normally controlled by the position of the feed member, and manually operable means for controlling the operation of the mechanism normally controlled by the position of the carrier.

19. A device of the character described, comprising a movable record support, a record carrier rotatable about and movable along a longitudinal vertical axis, means normally controlled by the longitudinal position of the carrier to cause the movement of the record support, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a vertical feed screw arranged parallel to the carrier, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved downwardly by the rotation of the feed screw, mechanism for disengaging the feed

member and controlled by the longitudinal position of said member, means for moving the feed member upwardly when disengaged from the feed screw, manually operable means for controlling the operation of the mechanism normally controlled by the position of the feed member, and manually operable means for controlling the operation of the mechanism normally controlled by the position of the carrier.

20. A device of the character described, comprising a movable record support, a record carrier rotatable about and movable along a longitudinal vertical axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a vertical feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved downwardly by the rotation of the feed screw, mechanism for disengaging the feed member from the feed screw and the carrier and controlled by the longitudinal position of the feed member, means for moving the feed member upwardly when disengaged from the feed screw and carrier, mechanism controlled by the position of the carrier for intermittently operating the movable record support, manually operable means for controlling the operation of the mechanism controlled by the position of the feed member, and manually operable means for controlling the operation of the mechanism normally controlled by the position of the carrier.

21. In a device of the character described, a record carrier adapted to rotate about and move along a longitudinal axis, means for rotating the carrier, a feed screw arranged parallel to and adjacent the carrier, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved longitudinally by the rotation of the feed screw, a rotatable cam, mechanism controlled by the longitudinal position of the feed member to rotatively connect the cam to the feed screw, and means operated by the cam in rotation to disconnect the feed member from the feed screw and the carrier.

22. A device of the character described, comprising a movable record support, a record carrier adapted to rotate about and move along a longitudinal axis, means for rotating the carrier, a feed screw arranged parallel and adjacent to the record carrier and rotatively connected therewith, a feed member engageable with the feed screw and with the carrier and adapted to be moved longitudinally by the rotation of the feed screw, a rotatable cam, mechanism controlled by the longitudinal position of the feed member to rotatively connect the cam



to the feed screw, means operated by the cam in rotation to disconnect the feed member from the feed screw and the carrier, and mechanism controlled by the position of the carrier to intermittently operate the movable record support.

23. A device of the character described, comprising a movable record support, a record reproducing mechanism arranged adjacent the support, a record carrier adapted to rotate about and move along a longitudinal axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation to engage and carry a record into proximity with the reproducing mechanism, a feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw and with the carrier and adapted to move longitudinally by the rotation of the feed screw, a rotatable cam, mechanism controlled by the longitudinal position of the feed member to rotatively connect the cam to the feed screw, means operated by the cam in rotation to disconnect the feed member from the feed screw and the carrier and to move the reproducing mechanism out of engagement with a record upon the carrier, and mechanism controlled by the position of the carrier to intermittently operate the movable record support.

24. A device of the character described, comprising a movable record support, a record reproducing mechanism arranged adjacent the support, a record carrier adapted to rotate about and move along a longitudinal axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation to engage and carry a record into proximity with the reproducing mechanism, a feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw and with the carrier and adapted to be moved longitudinally by the rotation of the feed screw, a rotatable cam, mechanism controlled by the longitudinal position of the feed member to rotatively connect the cam to the feed screw, means operated by the cam in rotation to first move the reproducing mechanism out of engagement with the record on the carrier and then to disconnect the feed member from the feed screw and the carrier, and mechanism controlled by the position of the carrier to intermittently operate the movable record support.

25. A device of the character described, comprising a record carrier adapted to rotate about and move along a longitudinal axis, means for rotating the carrier, a feed screw arranged adjacent and parallel to the carrier and rotatively connected therewith,

a feed member disengageably engaging the carrier and feed screw, means for moving the feed member back to its initial position when disengaged from the feed screw and the carrier, a reproducing mechanism, means controlled by the position of the feed member to move the reproducing mechanism in one direction, and means controlled by the position of the feed member to prevent the movement of the reproducing mechanism in the other direction.

26. A device of the character described, comprising a movable record support, a record carrier, means to move the record carrier to engage and remove a record from the support, a member slidable along and rotatable about an axis, a ratchet mechanism for moving the record support, means on the slidable and rotatable member for engaging with the ratchet mechanism, means for rotating said member, and means operated by the moving carrier to move the slidable and rotatable member.

27. A device of the character described, comprising a movable record support, a record carrier, means to move the record carrier to engage and remove a record from the support, a slidable shaft, a member rotatively mounted on the shaft, a ratchet mechanism for moving the record support and having a projecting arm, means for rotating said member on the slidable shaft, and means for sliding said shaft by virtue of the carrier motion thereby causing said member on the slidable shaft to be engageable with the ratchet arm.

28. A device of the character described, comprising a record support, a record carrier rotatable about and movable along a longitudinal axis, means for rotating the carrier, means for causing the movement of the carrier longitudinally to remove a record from the support, another means for causing another longitudinal movement of the carrier, mechanisms controlled by the position of the carrier to control the longitudinal movement causing means, and manually operable means for controlling one of the longitudinal movement causing means.

29. A device of the character described, comprising a movable record support, a record carrier, means to move the record carrier to engage a record and remove it from the support, mechanism controlled by the movement of the carrier to move the record support, and manually operable means for controlling the mechanism for moving the record support.

30. A device of the character described, comprising a horizontal revoluble table mounted on a vertical axis, said table having a plurality of record holding pockets near its periphery and adapted to hold cylindrical records in vertical positions, a ver-

5 tically movable and revoluble mandrel shaft adapted to pass up through the pockets in the record carrying table, a record engaging mandrel mounted on the upper end of the shaft, a reproducing mechanism mounted above the record carrying table, means to rotate the mandrel shaft, means to cause the elevation of the mandrel shaft to raise the mandrel to a point adjacent the reproducing mechanism, and means for feeding the mandrel shaft and mandrel downwardly to feed the record past the reproducing mechanism.

10 31. A device of the class described, comprising a vertically journaled shaft, a circular record supporting table mounted on the upper end of the shaft, said table having a plurality of record holding pockets near its periphery, a vertical mandrel shaft mounted in bearings to revolve and slide vertically, a record engaging mandrel on the upper end of the shaft, the mandrel adapted to pass through the pockets in the record supporting table and engage with the records therein, means to revolve the mandrel shaft, a screw thread mechanism whereby the revolution of the mandrel shaft serves to raise itself, means for feeding the mandrel shaft and mandrel downwardly from their uppermost position, means for intermittently rotating the record carrying table, said means including an actuating mechanism and a controlling mechanism adapted to be operated by the mandrel shaft when at its lowermost point of travel.

35 32. A device of the character described, comprising a horizontal record supporting member, said member having pockets therein for carrying cylindrical records with their axes vertical, a record carrying member adapted to move along and rotate around a vertical axis, mechanism for causing the rotation of the record carrying member and causing its vertical movement, mechanism for intermittently moving the record supporting member, and mechanism controlled by the position of the record carrying member to control the intermittently operating mechanism and the mechanism which causes the vertical movement of the record carrying member.

50 33. A device of the class described, comprising a horizontally movable record supporting table, a record carrying member arranged to move along and rotate around a vertical axis, a screw thread arranged around the vertical axis of the record carrying member, a stop arranged to move to and from the axis into and out of the screw thread, means for normally pressing the stop into the screw thread, a detent for holding the stop out of the screw thread, means for intermittently actuating the record supporting table, means connected with said actuating means to engage with the

detent and withdraw it from engagement with the stop, and controlling means for the said intermittently actuating means, said controlling means adapted to be actuated by the record carrying member when at its lowermost point.

70 34. A device of the character described, comprising a movable record support, a record carrier adapted to move along and rotate around a longitudinal axis, mechanism for causing the rotation and longitudinal movement of the record carrier to pick up a record and carry it longitudinally from the record support, mechanism for intermittently moving the record support, and mechanism controlled by the position of the record carrier to control the intermittently operating mechanism and the mechanism which causes the longitudinal movement of the record carrier.

85 35. A device of the character described, comprising a movable record support, a record carrier adapted to move along and rotate around a longitudinal axis, means for rotating said carrier, mechanism for causing the longitudinal movement of the carrier by virtue of its own rotation, mechanism for intermittently moving the record support, and mechanism controlled by the position of the record carrier to control the intermittently operating mechanism and the mechanism which causes the longitudinal movement of the record carrier.

90 36. A device of the character described, comprising a support adapted for supporting a plurality of records, a record carrier adapted to move along and to rotate around a longitudinal axis, the longitudinal movement of the carrier engaging and removing longitudinally a record from the support, means to rotate and to move the carrier longitudinally, and mechanism controlled by the position of the carrier to control the means for moving the carrier longitudinally.

105 37. A device of the character described, comprising a support adapted for supporting a plurality of records, a record carrier adapted to move along and to rotate about a longitudinal axis, the longitudinal movement of the carrier engaging and removing longitudinally a record from the support, means to rotate the carrier, mechanism to cause the longitudinal movement of the carrier by virtue of its own rotation, and means controlled by the position of the carrier to control the longitudinal movement mechanism.

110 38. A device of the character described, comprising a record support, a record carrier adapted to move along and rotate about a longitudinal axis, means to rotate the carrier, means to cause a longitudinal movement thereof to remove a record from the support, another means to cause another longitudinal movement of the carrier, and



mechanisms controlled by the position of the carrier to control the operation of the means causing the longitudinal movements of the carrier.

39. A device of the character described, comprising a record support, a record carrier adapted to move along and rotate about a longitudinal axis, means to rotate the carrier, means to cause a longitudinal movement of the carrier, another means to cause another longitudinal movement of the carrier by virtue of its own rotation, mechanism controlled by the position of the carrier to control the operation of the first mentioned carrier longitudinal moving means, and mechanism controlled by the position of the carrier to control the operation of the mechanism causing the longitudinal movement of the carrier by virtue of its own rotation.

40. A device of the character described, comprising a record support, a record carrier adapted to move along and to rotate about a longitudinal axis, means to rotate the carrier, means to cause a longitudinal movement of the carrier to remove a record from the support, another means to cause another longitudinal movement of the carrier, means for intermittently moving the record support, and mechanisms controlled by the position of the carrier to control the operation of the record support moving mechanism and to control the operation of the means causing the longitudinal movements of the carrier.

41. A device of the character described, comprising a record support, a record carrier adapted to move along and to rotate about a longitudinal axis, means to rotate the carrier, a mechanism to cause the longitudinal movement of the carrier by virtue of its own rotation, another mechanism for causing the longitudinal movement of the carrier by virtue of its own rotation but in a ratio differing from that caused by the first mentioned mechanism, and means controlled by the position of the carrier to control the longitudinal movement mechanisms.

42. A device of the character described, comprising a record support, a record carrier adapted to move along and to rotate about a longitudinal axis, means to rotate the carrier, mechanism to cause the longitudinal movement of the carrier by virtue of its own rotation, another mechanism to cause the longitudinal movement of the carrier by virtue of its own rotation but in a ratio different and in a direction opposite that caused by the first mentioned mechanism, and means controlled by the position of the carrier to control the longitudinal movement mechanisms.

43. A device of the character described, comprising a record support, a record engaging mandrel, a mandrel shaft carrying

said mandrel and adapted to move along and to rotate about a longitudinal axis, means to rotate the mandrel shaft, screw mechanism to cause the longitudinal movement of the mandrel shaft by virtue of its own rotation, another screw mechanism to cause the longitudinal movement of the mandrel shaft by virtue of its own rotation but in a ratio different from that caused by the first mentioned mechanism, and means controlled by the position of the mandrel shaft to control the longitudinal movement mechanisms.

44. A device of the character described, comprising a record support, a record engaging mandrel, a mandrel shaft carrying said mandrel and adapted to move along and to rotate about a longitudinal axis, means to rotate the mandrel shaft, screw mechanism to cause the longitudinal movement of the mandrel shaft by virtue of its own rotation, a feed screw arranged parallel to the mandrel shaft, means for connecting said feed screw with the mandrel shaft, and means controlled by the position of the mandrel shaft to control the longitudinal movement mechanism and to control the connection of the feed screw with the mandrel shaft.

45. A device of the character described, comprising a record support, a record engaging mandrel, a mandrel shaft carrying said mandrel and having screw threads cut in its exterior surface, a feed screw arranged parallel with the mandrel shaft, means for connecting the feed screw with the mandrel shaft, a member adapted to cooperate with the screw threads in the mandrel shaft to cause its longitudinal movement when rotated, mechanisms controlled by the position of the mandrel shaft to control the cooperation of said member with said screw threads and to control the connection of the feed screw with the mandrel shaft, and means to rotate the mandrel shaft and the feed screw.

46. A device of the character described, comprising a record support, a record engaging mandrel, a mandrel shaft carrying said mandrel and having a screw thread thereon, a stop adapted to engage and disengage with said screw thread and immovable in a direction parallel to the mandrel shaft, thereby to cause the longitudinal movement of the mandrel when rotated, means for moving the stop into and out of the screw thread, a feed screw arranged parallel to the mandrel shaft, connecting means between the feed screw and the mandrel shaft, said connecting means comprising a slidable member having means for engagement with the mandrel shaft and having means for engagement with the feed screw, means controlled by the position of the mandrel shaft to control the operation of the stop movement means and to control the operation of the means to connect the mandrel shaft with

the feed screw, and means to rotate the mandrel shaft and the feed screw.

47. A device of the character described, comprising a record support, a record carrier adapted to move along and rotate about a longitudinal axis, means to rotate the carrier, means to cause a longitudinal movement of the carrier to remove a record from the support, a reproducing mechanism into proximity with which the record is moved, means to cause another longitudinal movement of the carrier by virtue of its rotation to engage the record with the reproducing mechanism, mechanisms controlled by the position of the carrier to control the operations of the means causing the longitudinal movements of the carrier, and mechanism to move the reproducing mechanism into and out of engagement with a record on the carrier.

48. A device of the character described, comprising a record support, a record carrier adapted for movement along and rotation about a vertical axis, means for rotating the carrier, means for causing the record carrier to move upwardly to engage a record and move it from the record support, means for causing the carrier to move downwardly by virtue of its own rotation, and mechanisms controlled by the position of the carrier to control the means for causing the carrier movements.

49. In a device of the character described, a record carrier adapted for rotation about and movement along a vertical axis, a vertical feed screw adjacent the carrier and rotatively connected therewith, means engageable with the threads of the feed screw and engageable with the carrier whereby the carrier and engaging means are moved downwardly, means for moving the engaging means upwardly, and mechanism controlled by the position of the engaging means to disengage the engaging means from the feed screw and carrier.

50. In a device of the character described, a record carrier adapted for rotation about and movement along a vertical axis, means for moving the carrier upwardly, a vertical feed screw adjacent the carrier and rotatively connected therewith, means engageable with the threads of the feed screw and engageable with the carrier whereby the carrier and engaging means are moved downwardly, means for moving the engaging means upwardly, and mechanism controlled by the position of the engaging means to disengage the engaging means from the feed screw and carrier.

51. In a device of the character described, a record carrier adapted for rotation about and movement along a vertical axis, means for causing the upward movement of the carrier by virtue of its own rotation, a vertical feed screw adjacent the carrier and

rotatively connected therewith, means engageable with the threads of the feed screw and engageable with the carrier whereby the carrier and engaging means are moved downwardly, means for moving the engaging means upwardly, and mechanism controlled by the position of the engaging means to disengage the engaging means from the feed screw and carrier.

52. In a device of the character described, a record carrier adapted for rotation about and movement along a vertical axis, means for causing the upward movement of the carrier by virtue of its own rotation, a vertical feed screw adjacent the carrier and rotatively connected therewith, means engageable with the threads of the feed screw and engageable with the carrier whereby the carrier and engaging means are moved downwardly, means for moving the engaging means upwardly, mechanism controlled by the position of the carrier to control the operation of the means for causing the upward movement of the carrier, and mechanism controlled by the position of the engaging means to disengage the engaging means from the feed screw and carrier.

53. A device of the character described, comprising a record support, a record reproducing mechanism, a record carrier rotatable about and movable along a longitudinal axis, means for rotating the carrier, means for causing the movement of the carrier longitudinally to engage a record on the support and move it longitudinally into proximity with the reproducing mechanism, and means cooperating with the carrier to move the reproducing mechanism relatively to the record on the carrier.

54. A device of the character described, comprising a record support, a record carrier rotatable about and movable along a longitudinal axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a feed screw arranged parallel to the carrier, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved longitudinally, mechanism for disengaging the feed member and controlled by the longitudinal position of said member, and mechanism for controlling the means for causing a longitudinal movement of the carrier and controlled by the longitudinal position of the carrier.

55. A device of the character described, comprising a record support, a record carrier rotatable about and movable along a longitudinal vertical axis, means for rotating the carrier, a vertical feed screw arranged parallel to the carrier, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved downwardly by the rotation of the feed



screw, mechanism for disengaging the feed member and controlled by the longitudinal position of said member, and means for moving the feed member upwardly when disengaged from the feed screw.

56. A device of the character described, comprising a movable record support, a record carrier rotatable about and movable along a longitudinal axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member, engageable with the screw threads of the feed screw and with the carrier to be moved longitudinally by the rotation of the feed screw, mechanism for disengaging the feed member controlled by the longitudinal position of said member, and mechanism controlled by the position of the carrier to operate the movable record support.

57. A device of the character described, comprising a movable record support, a record carrier rotatable about and movable along a longitudinal vertical axis, means for rotating the carrier, means for causing the longitudinal movement of the carrier by virtue of its own rotation, a vertical feed screw arranged parallel to the carrier and rotatively connected therewith, a feed member engageable with the screw threads of the feed screw and with the carrier to be moved downwardly by the rotation of the feed screw, mechanism for disengaging the feed member from the feed screw and the carrier and controlled by the longitudinal position of the feed member, means for moving the feed member upwardly when disengaged from the feed screw and carrier, and mechanism controlled by the position of the carrier for intermittently operating the movable record support.

58. In a device of the character described, a record carrier adapted for rotation about and movement along a longitudinal axis, a feed screw arranged parallel to the carrier, means to rotate the feed screw and carrier, a feed member engageable with the feed screw and adapted to be moved longitudinally by the rotation thereof, means for moving the feed member in the direction opposite to that of its screw fed movement, means on the carrier engageable by the feed member whereby the carrier is moved with the feed member during its screw fed movement, means controlled by the position of the carrier and feed member for disengaging the feed member from the carrier, and means for causing the movement of the carrier in the direction opposite to its screw fed movement.

59. A device of the character described, comprising a horizontal record supporting

table, a vertical shaft about which the table is adapted to rotate, means for supporting records at points around the periphery of the table, means for engaging the records on the table and removing them therefrom, and means controlled by said last mentioned means for intermittently rotating said table.

60. A device of the character described, comprising a horizontal table having apertures in its upper surface for the reception of records, a vertically movable record carrier adapted to engage the records and move them from the table, means to move the record carrier, and means controlled by the movement of the record carrier to intermittently rotate the table.

61. In a device of the character described, a record supporting table comprising a vertical shaft, and a horizontal table member mounted on the shaft to rotate about its vertical axis, the table having a series of vertical openings therethrough near its outer periphery and each opening having an annular shelf upon which a record may rest.

62. In a device of the character described, a horizontal record supporting table adapted to rotate about a vertical axis, the table having a plurality of apertures extending vertically therethrough near its outer periphery, each of the apertures having an annular shelf upon which a record is adapted to rest, a record carrier located beneath the table and adapted to move upwardly through one of the apertures in the table and to engage a record and remove it from the table, means to move the record carrier in a vertical direction, and mechanism controlled by the movement of the record carrier to intermittently rotate the table.

63. A device of the character described, comprising a record support, a record reproducing mechanism, a record carrier adapted to move along and to rotate around a longitudinal axis, the longitudinal movement of the carrier engaging and removing longitudinally a record from the support, means to rotate and to move the carrier longitudinally, mechanism controlled by the position of the carrier to control the means for moving the carrier longitudinally, and means coöperating with the carrier to cause the movement of the reproducing mechanism relatively to a record on the carrier.

64. A device of the class described, comprising a record support, a record reproducing mechanism, a record carrier adapted to move along and to rotate about a longitudinal axis, the longitudinal movement of the carrier engaging and removing longitudinally a record from the support and moving the record into proximity with the reproducing mechanism, means to rotate the carrier, mechanism to cause the longitudinal movement of the carrier by virtue of its own

rotation, means controlled by the position  
of the carrier to control the longitudinal  
movement causing mechanism, and means  
coöperating with the carrier to cause the  
5 movement of the reproducing mechanism  
relatively to the record on the carrier.

In witness that we claim the foregoing

we have hereunto subscribed our names this  
18th day of May, 1911.

HARRY T. SCOTT.  
LEO J. PATTERSON.

Witnesses:

JAMES T. BARKELEW,  
ELWOOD H. BARKELEW.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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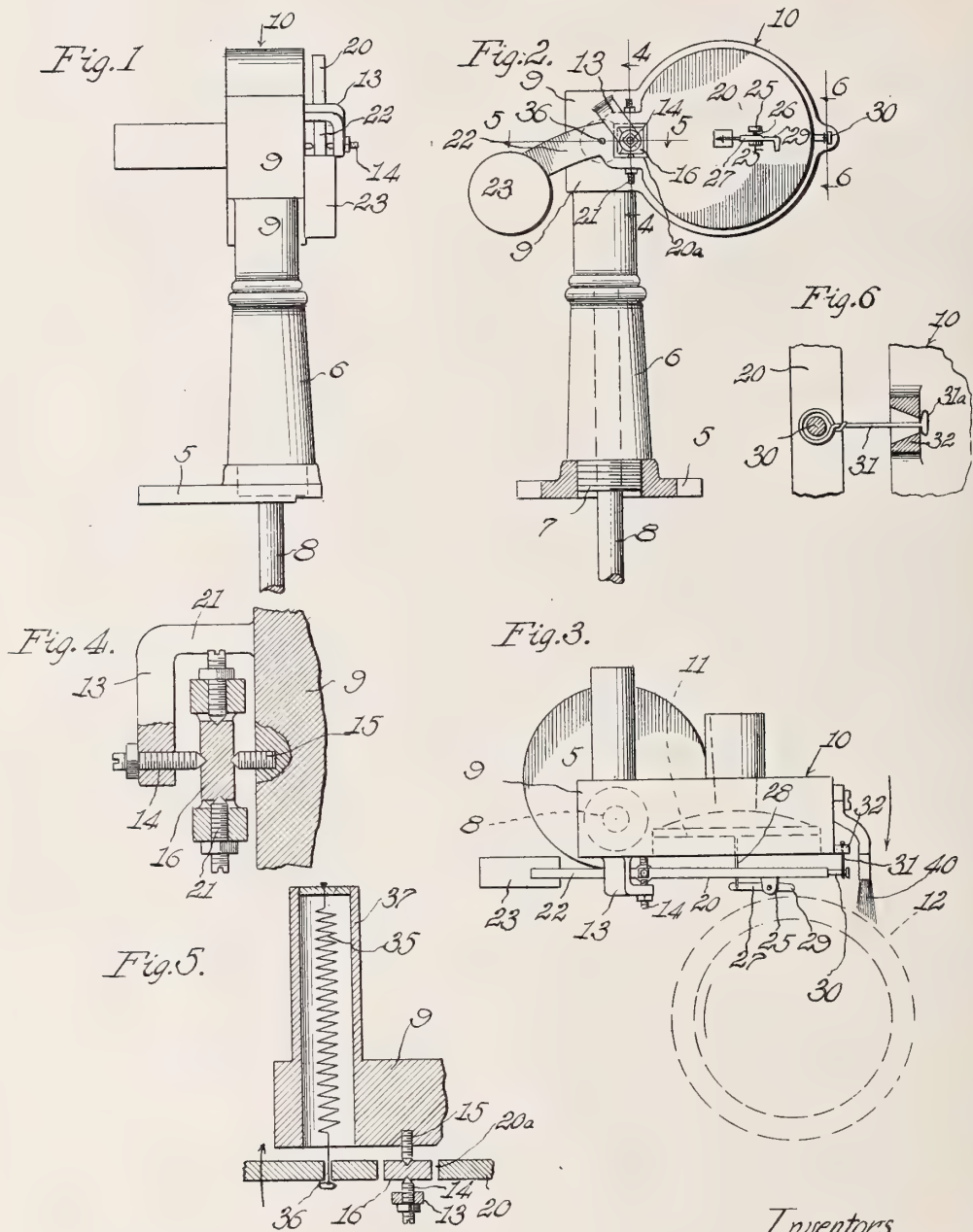




H. T. SCOTT & L. J. PATTERSON.  
 REPRODUCER FOR PHONOGRAPHS.  
 APPLICATION FILED JUNE 14, 1911.

1,040,030.

Patented Oct. 1, 1912.



Witnesses.  
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 B. in Mordie

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 by James T. Barber  
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# UNITED STATES PATENT OFFICE.

HARRY T. SCOTT AND LEO J. PATTERSON, OF LOS ANGELES, CALIFORNIA; SAID  
PATTERSON ASSIGNOR TO SAID SCOTT.

## REPRODUCER FOR PHONOGRAPHS.

1,040,030.

Specification of Letters Patent.

Patented Oct. 1, 1912.

Application filed June 14, 1911. Serial No. 633,127.

*To all whom it may concern:*

Be it known that we, HARRY T. SCOTT and LEO J. PATTERSON, citizens of the United States, residing at Los Angeles, in the  
5 county of Los Angeles, State of California, have invented new and useful Improvements in Reproducers for Phonographs, of which the following is a specification.

This invention relates to a reproducer  
10 mechanism adapted particularly for use in connection with a cylindrical (Edison type) record held with its axis vertical.

In the ordinary type of phonograph the record is held horizontally and the repro-  
15 ducer engages the record sound groove which is approximately in a vertical plane. Our new reproducer is adapted for use when supported with the needle in position to engage with the sound groove ap-  
20 proximately in a horizontal plane; and this necessitates a novel form of support and construction which we have embodied in our reproducer.

Our reproducer is particularly for use in  
25 connection with our automatic phonograph machine for which we have filed applications for United States Letters Patent on February 1st, 1911, bearing Serial No. 605,881, and May 27th, 1911, bearing Serial No. 629,892; but we may use this re-  
30 producer in connection with any machine which plays a record in a vertical position. This being the prime essential—playing the record in a vertical position—the salient features of our invention are embodied in the mechanism which enables us to hold the stylus, or reproducing point, in engagement with the sound groove in that position. We  
35 have provided a novel form of support, universal in its nature, for the stylus and we have provided means for holding the stylus in a normal position and for returning it to this normal position when it has been moved therefrom by the action of the sound  
40 groove. The stylus is allowed movement in all the directions necessary for following the sound groove accurately. These features will be best understood from consideration of the following specification and the accompanying drawings, in which:

Figure 1 is a side elevation of our improved reproducer. Fig. 2 is a front elevation of the same. Fig. 3 is a plan view of the same. Fig. 4 is an enlarged detail  
45 section taken on line 4—4 of Fig. 2. Fig. 5

is an enlarged detail section taken on line 5—5 of Fig. 2. Fig. 6 is an enlarged section taken on line 6—6 of Fig. 2.

In the drawings 5 designates a base of any suitable proportions and size to suit the machine on which the reproducer is mounted. Mounted upon this base is a pillar 6, preferably screw threaded at 7 into the base so that it may be raised or lowered by rotation and the height of the reproducer carried above thus adjusted. A vertical shaft  
65 8 passes through the pillar 6 and carries on its upper end a suitable block or other member 9 on which sound box 10 is mounted. Sound box 10 is mounted on block 9 at one side and is placed with its axis in a horizontal position so that diaphragm 11 therein is in a substantially vertical plane. The sound box rotates about the axis of vertical shaft  
70 8 and is moved in the direction indicated in Fig. 3 to throw the stylus or reproducing point into engagement with a record (shown at 12 in dotted lines in Fig. 5). The sound box is of any ordinary construction; we have shown one of the general construction  
80 now in use on machines playing cylindrical records; its particulars of construction have no bearing on the present invention. Extending outwardly and downwardly from block 9 is an arm 13 which carries in its end  
85 a pivot screw 14 projecting inwardly toward the block (see Fig. 4). A pivot screw 15 is placed in block 9 directly opposite pivot screw 14 and these pivot screws support a pivot block 16 between them, the block turning in a vertical plane on the horizontal axis formed by the screws. Pivot block 16 may be, and is preferably, of some hard material, say hardened steel or a jewel. A stylus plate  
90 20 is provided of the usual configuration, with the exceptions hereinafter noted, and carries the stylus in the ordinary manner. This stylus plate is provided with an aperture 20<sup>a</sup> which surrounds pivot block 16 and it is provided with pivot screws 21 engaging with the pivot block and arranged on a vertical axis so that the stylus plate may have a horizontal movement around the pivot block. The stylus plate has an extension 22 carrying a counter-balance weight  
105 23 on its end so as to balance the stylus plate on the horizontal pivot formed by screws 14 and 15 and to normally hold it in the position shown. Weight 23 is so placed that the center of gravity of the whole stylus plate  
110



and extensions is preferably immediately beneath the horizontal pivot and thus has a tendency to bring the stylus plate to the position shown whenever it is displaced therefrom by vertical movement of either of its ends. The distance of the center of gravity below the horizontal pivot is preferably very slight so that there will be a very slight pressure tending to equilibrate the stylus plate and consequently a very slight pressure tending to move the stylus against the side walls (top or bottom) of the sound record groove.

On stylus plate 20 a pair of lugs 25 is placed and these lugs carry a small pivot pin 26 between them, and held vertically, on which the stylus lever 27 is mounted. Stylus lever 27 is connected by member 28 to diaphragm 11 and carries stylus point 29 on its outer end. This stylus point is adapted to be thrown into engagement with a record 12 by movement of the whole reproducing mechanism in the direction indicated in Fig. 3. It will be seen from Fig. 2 that the stylus lever does not occupy the full space between lugs 25, so that it is free to move vertically on the pivot pin 26 to a small extent without moving the stylus plate vertically. The stylus lever is normally gravitated against the lower lug 25 and will normally remain in this position unless there is a sharp upward movement of the stylus. In this case the stylus lever will move upwardly independently of the stylus plate and will consequently move more easily and with greater freedom to follow any vertical variations of the sound groove than if it were tightly placed between lugs 25. We mention this feature particularly as we note that in a late Patent, No. 991,424, where the stylus pivot pin 26 is horizontal, a small spring is utilized to hold the stylus lever against one of the lugs 25 and to thereby prevent any looseness and any noise arising from that looseness. In our construction gravity effects the desired result rather than a spring.

On the end of the stylus plate a pin 30 is placed and a small wire 31 encircles the pin and passes through a lug 32 in the relatively stationary sound box 10. An enlargement 31<sup>a</sup> on the end of the wire prevents the stylus plate from moving away from the sound box at this point while allowing it a certain amount of movement independently of the sound box. The stylus plate is normally held in the position shown by means of a spring 35 attached at 36 to the stylus plate and on the opposite side of the pivotal point pin 30. Spring 35 is housed within a small tube 37 and normally pulls the stylus plate in the direction indicated in Fig. 5, thus holding the parts in the position shown in Fig. 6. The pull of spring 35 is sufficient to cause wire

31 to be pulled straight upwardly into the position shown in Fig. 6 and to thereby assist in holding the stylus plate in its correct position as regards rotation on the horizontal pivot formed by pivot screws 14 and 15. This aids in quickly bringing the stylus plate back to its normal position whenever it is carried out of that position by the action of the sound groove on the stylus; but it will be seen that, when the stylus plate is pushed back toward the sound box, as it always is when the stylus is in engagement with a record, then the stylus plate is free to move vertically on its horizontal pivot, at least so far as the action of spring 35 and wire 31 is concerned; for the wire is then loose and has no tendency to draw the stylus plate to its normal middle position. But there is a slight tendency, on account of the arrangement of the center of gravity of the stylus plate below its horizontal pivot, to bring the stylus point back to its normal position as regards vertical movement. Thus, while a record is being reproduced, there is a slight tendency, although sufficient, to bring the stylus point to its normal middle position and to arrange the stylus plate on the sound box in its normal position; while, when the record is removed from engagement with the stylus, there is a tendency of some greater degree exerted by spring 35 and the action of wire 31 to bring the stylus plate and stylus back to their normal positions. This arrangement has this advantage; that the stronger positioning force is rendered inactive while a record is being played and that there is consequently no great tendency for the stylus to bear disproportionately upon either the upper or the lower edge of the sound groove.

As one of the requisites for efficient action in our device is the relative immovability of the sound box, we may provide means for preventing the vibrations of the diaphragm being transmitted to the box. This is most conveniently done by increasing the inertia of the box in some manner, preferably by making the box or some attached parts of considerable weight.

In the sound box we have shown a small brush 40 mounted so as to be thrown into engagement with the record when the stylus engages the same. This brush cleans the record from any accumulated dust and causes a smoother reproduction than otherwise.

We have described a peculiar form of mechanism for supporting the sound box so that it can be moved to and from a record held in a vertical position. Although we have found this form and construction very convenient, we do not care to limit ourselves to this mode of supporting the sound box or other relatively stationary parts of the reproducer. What we do wish to claim is our

general structure for supporting the stylus, and specifically for supporting the stylus through the stylus plate, upon the sound box or other relatively stationary parts of the reproducing mechanism. The method of mounting the stylus upon the plate is old; it is in the method of supporting the stylus plate, irrespective of the method of stylus mounting, that our invention resides.

Broadly speaking, there is great utility in the mere mounting of the stylus plate in a vertical plane; so that it moves horizontally to and from the record. The pressure of the stylus point against the record is caused solely by the resilient means used to move the stylus plate horizontally. The weight of the stylus plate does not come on the record at all; and for this reason its mass may be greatly increased. (In the ordinary style of reproducer the stylus plate is termed a "floating weight" and is supported by the stylus resting on the record). The efficiency of transmission of vibrations from the stylus to the diaphragm depends largely on the non-participation of the stylus plate in such vibrations; in other words, the stylus plate should only move for variations in the surface of the record, while the stylus should individually, with relation to the stylus plate, follow the full variations of the sound groove. Immobility of the stylus plate with reference to the high speed sound vibrations can well be attained by increasing the mass of the stylus plate; and our method of relieving the record of the weight of the plate enables us to greatly increase its mass. (This cannot be done in the usual arrangement on account of the record having to bear the increased weight. In the usual arrangement of the stylus plate, the stylus plate mass and the pressure of the stylus on the record are inseparably correlated—it is impossible to increase one without increasing the other). In our mechanism the pressure of the stylus point on the record is typically determined solely by the tension of a spring; this may be varied to suit conditions, while the stylus plate may have sufficient mass that its inertia may make it relatively stationary.

Having described our invention, we claim:

1. A device of the character described, comprising a relatively stationary sound box having a diaphragm therein, a stylus plate pivotally mounted on the sound box to have pivotal movement in horizontal and vertical planes, the center of gravity of the stylus plate being arranged below the pivotal point of the stylus plate on the sound box, yielding means for holding the stylus plate horizontally away from the sound box, and a stylus movably mounted on the stylus plate and projecting horizontally therefrom and connected with the diaphragm in the

sound box, said stylus being arranged and moving on the stylus plate approximately in the horizontal plane passing through the pivotal point of the stylus plate on the sound box.

2. A device of the character described, comprising a relatively stationary sound box having a diaphragm therein, a stylus plate pivotally mounted on the sound box to have pivotal movement in horizontal and vertical planes, the center of gravity of the stylus plate being arranged below the pivotal point of the stylus plate on the sound box, yielding means for holding the stylus plate horizontally away from the sound box, means for limiting the movement of the stylus plate away from the sound box, and a stylus movably mounted on the stylus plate and projecting horizontally therefrom and connected with the diaphragm in the sound box, said stylus being arranged and moving on the stylus plate approximately in the horizontal plane passing through the pivotal point of the stylus plate on the sound box.

3. A device of the character described, comprising a relatively stationary sound box having a diaphragm therein, a pivot block supported on a horizontal axis on the sound box, said horizontal axis extending at right angles to the plane of the diaphragm in the sound box, a stylus plate arranged in a vertical plane adjacent the sound box, pivot members arranged along a vertical axis on the stylus plate and engaging the pivot block to allow the stylus plate a movement relative to the sound box about both a horizontal and a vertical axis, the stylus plate being arranged on one side of said pivot block, a weighted extension of the stylus plate extending on the other side of said pivot block, the arrangement being such that the center of gravity of the stylus plate and its extension falls approximately directly beneath the horizontal pivot of the pivot block on the sound box, a spring attached to the sound box and to the extension of the stylus plate and tending to rotate the stylus plate about its vertical axis and to move it away from the sound box, a link loosely engaging with the stylus plate and connected with the sound box and arranged in the horizontal plane determined by the horizontal axis of the stylus plate and adapted to limit the movement of the stylus plate away from the sound box, a stylus lever pivotally mounted on the stylus plate, a stylus carried on one end of the stylus lever, and connecting means between the other end of the stylus lever and the diaphragm in sound box.

4. In combination a reproducer comprising a relatively stationary sound box having a diaphragm therein, a pivot block supported on a horizontal axis on the sound box,



said horizontal axis extending at right angles to the plane of the diaphragm in the sound box, a stylus plate arranged in a vertical plane adjacent the sound box, pivot members arranged along a vertical axis on the stylus plate and engaging the pivot block to allow the stylus plate a movement relative to the sound box about both a horizontal and a vertical axis, the stylus plate being arranged on one side of said pivot block, a weighted extension of the stylus plate extending on the other side of said pivot block, the arrangement being such that the center of gravity of the stylus plate and its extension falls approximately directly beneath the horizontal pivot of the pivot block on the sound box, a spring attached to the sound box and to the extension of the stylus plate and tending to rotate the stylus plate about its vertical axis and to move it away from the sound box, a link loosely engaging with the stylus plate and connected with the sound box and arranged in the horizontal plane determined by the horizontal axis of the stylus plate and adapted to limit the movement of the stylus plate away from the sound box, a stylus lever pivotally mounted on the stylus plate, a stylus carried on one end of the stylus lever, connecting means between the other end of the stylus lever and the diaphragm in sound box, and a brush mounted on the sound box to engage a sound record when engaged by the stylus.

5. A device of the character described, comprising a frame, a stylus plate pivotally mounted thereon to have movement in both horizontal and vertical planes, the center of gravity of the stylus plate being below the pivotal support thereof, a stylus mounted on the plate and projecting its point horizontally, yielding means for moving the stylus plate horizontally, and a link extending horizontally between the frame and the stylus plate and loosely connected to both the frame and plate.

6. A device of the character described, comprising a relatively stationary sound box having a vibratory member therein, a vertically arranged stylus plate, a universal pivot on which the stylus plate is balanced, the stylus plate normally moving to and from the sound box in a horizontal plane about the pivot, a stylus mounted on the plate to move horizontally thereon, and connection between the stylus and the vibratory member.

7. A device of the character described, comprising a relatively stationary sound box having a vibratory member therein a vertically arranged stylus plate, a universal pivot on which the stylus plate is balanced, the stylus plate normally moving to and from the sound box in a horizontal plane about the pivot, a stylus mounted on the plate to move horizontally thereon, connection between the stylus and the vibratory member, and resilient means moving the stylus plate about the pivot and in a direction away from the sound box.

8. A device of the character described, comprising a relatively stationary sound box having a vibratory member therein, a stylus plate mounted on the side of the sound box to have universal movement thereon, the center of gravity of the stylus plate being below its point of support, a stylus mounted on the stylus plate to move horizontally thereon to and from the sound box, a connection between the stylus and the vibratory member, and resilient means to move the stylus plate horizontally from the sound box.

In witness that we claim the foregoing we have hereunto subscribed our names this 8th day of June 1911.

HARRY T. SCOTT.  
LEO J. PATTERSON.

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H. T. SCOTT & L. J. PATTERSON.  
AUTOMATIC PHONOGRAPH.

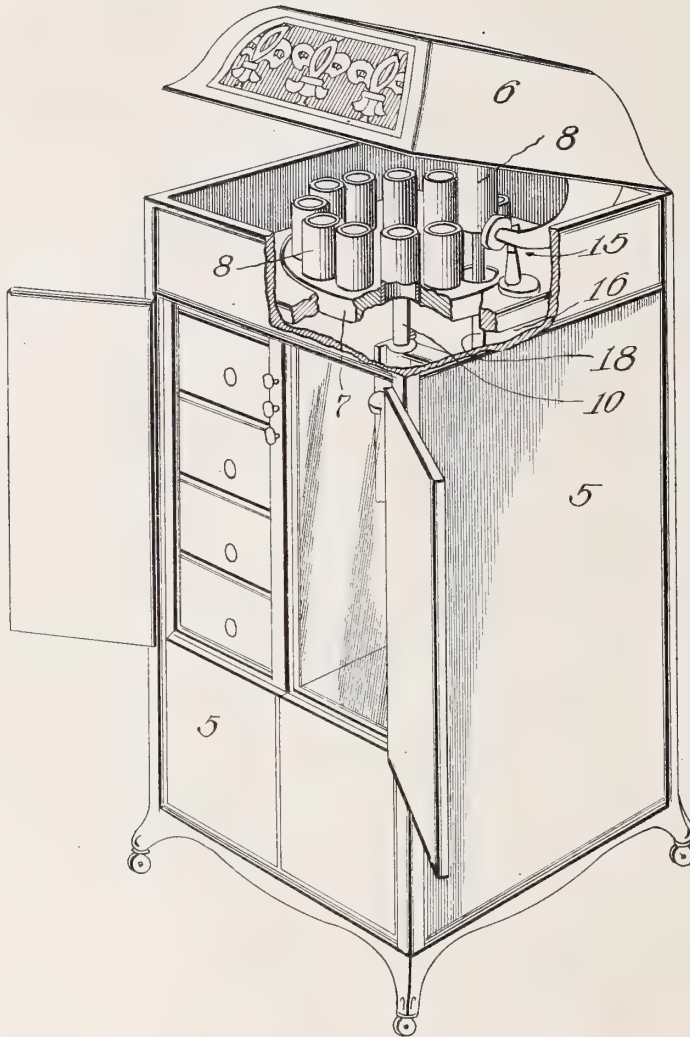
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1,040,031.

Patented Oct. 1, 1912.

6 SHEETS—SHEET 1.

*Fig. 1.*



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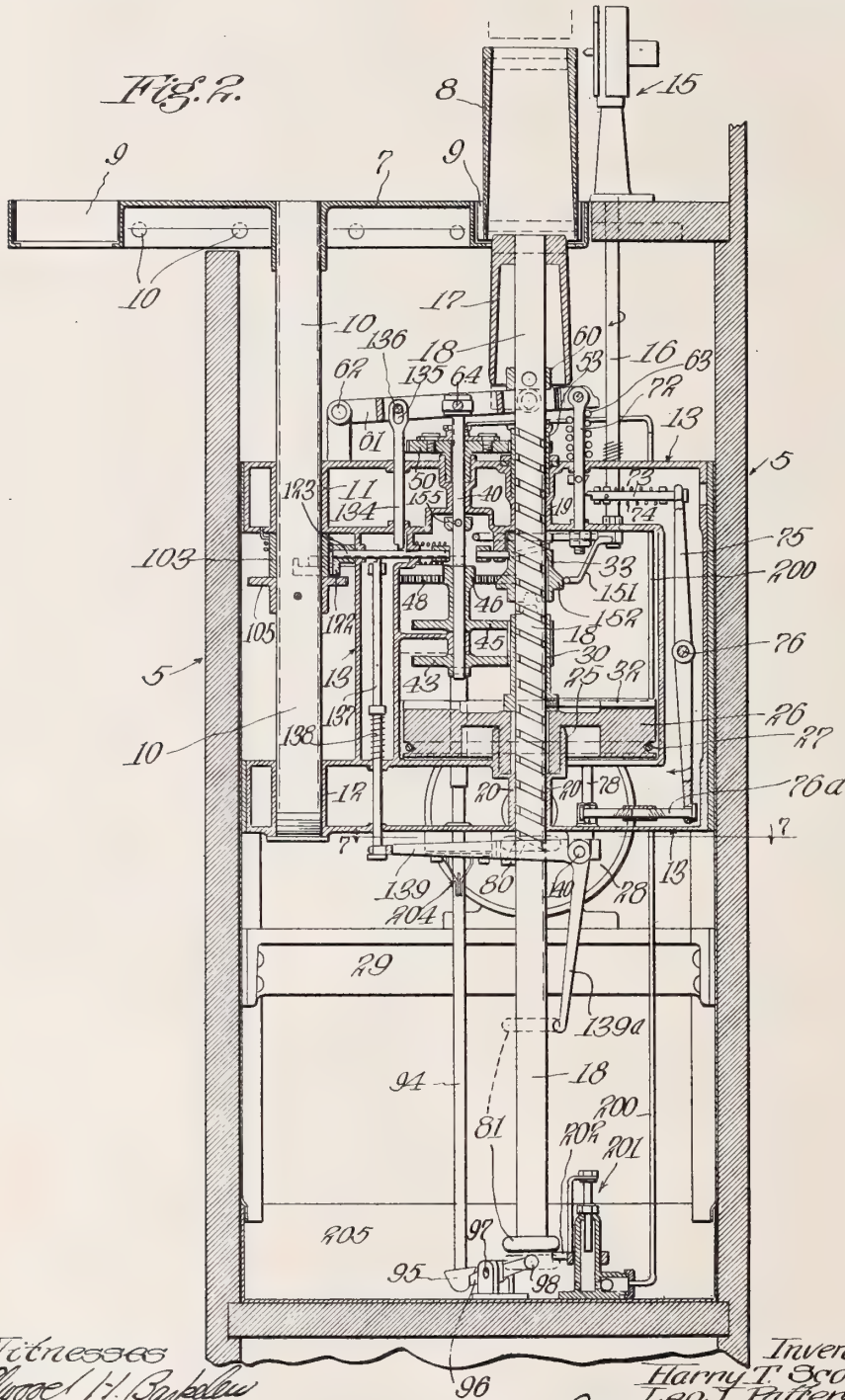
AUTOMATIC PHONOGRAPH.

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1,040,031.

Patented Oct. 1, 1912.

6 SHEETS—SHEET 2.



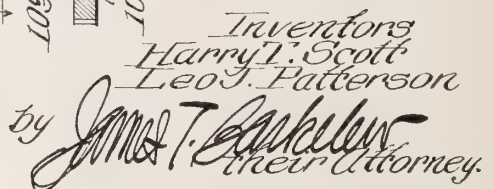
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APPLICATION FILED AUG. 15, 1911.

6 SHEETS—SHEET 3.







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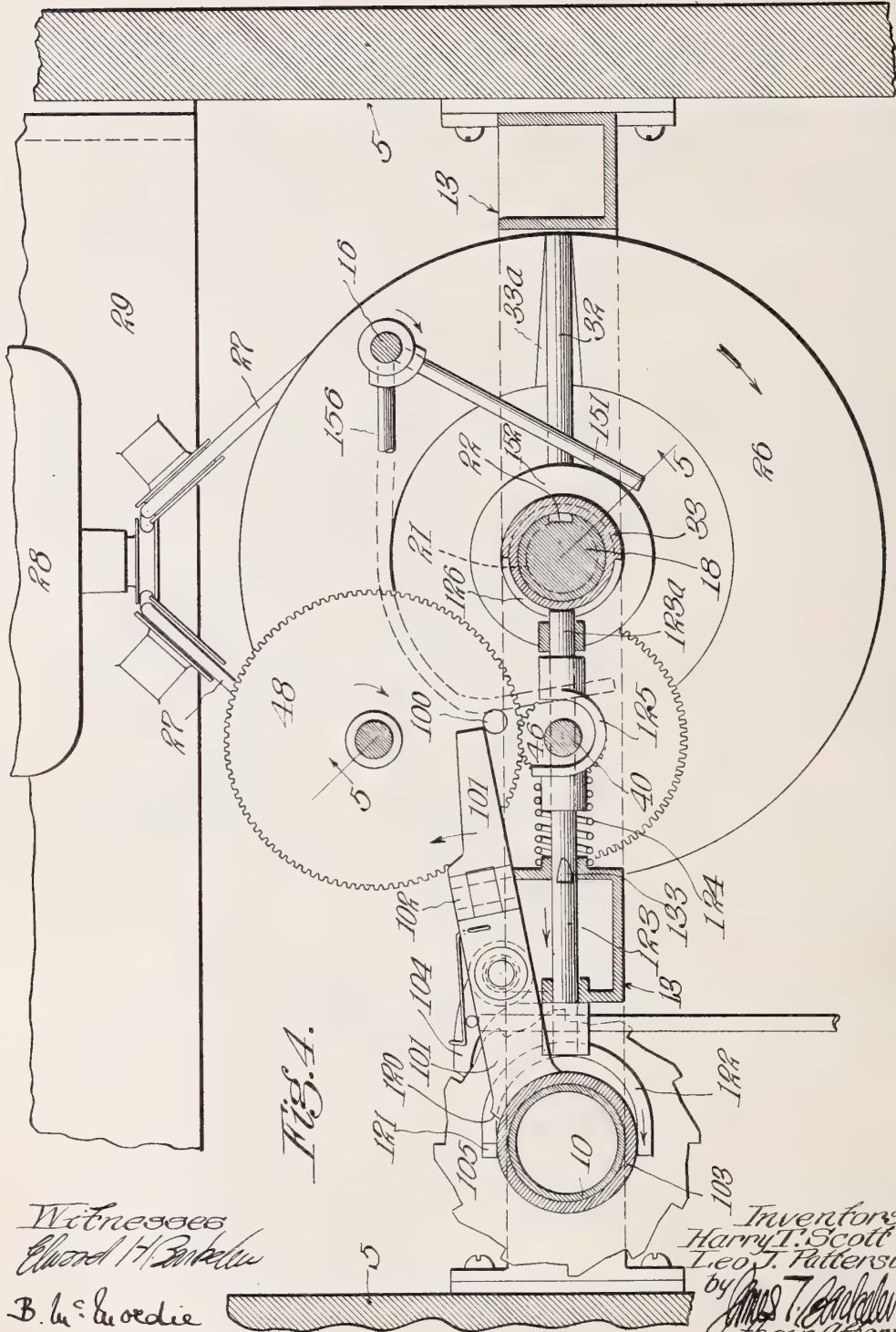
AUTOMATIC PHONOGRAPH.

APPLICATION FILED AUG. 15, 1911.

Patented Oct. 1, 1912.

6 SHEETS—SHEET 4.

1,040,031.



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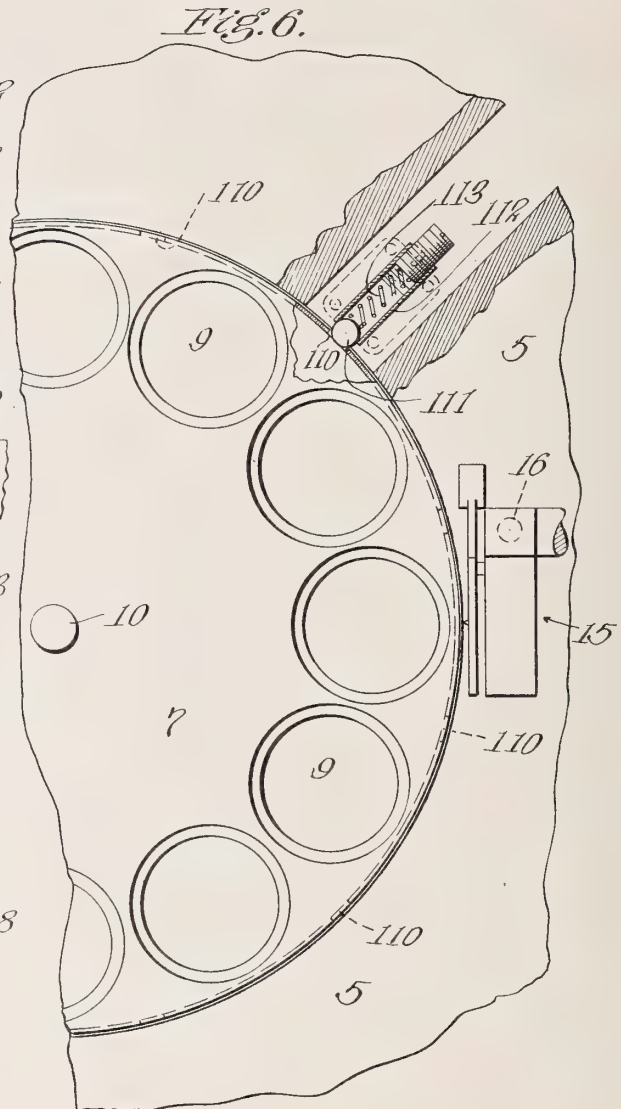
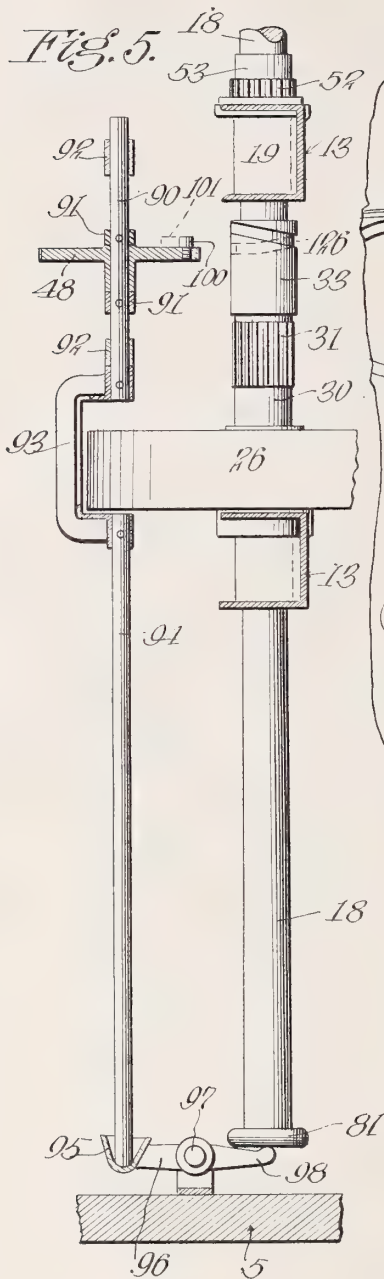


H. T. SCOTT & L. J. PATTERSON.  
 AUTOMATIC PHONOGRAPH.  
 APPLICATION FILED AUG. 15, 1911.

1,040,031.

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6 SHEETS—SHEET 5.



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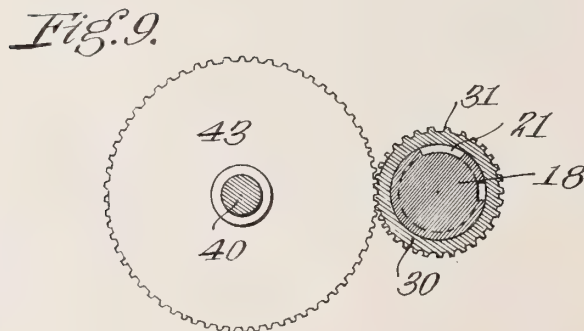
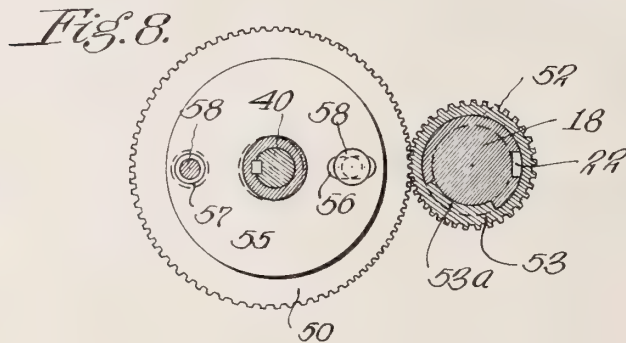
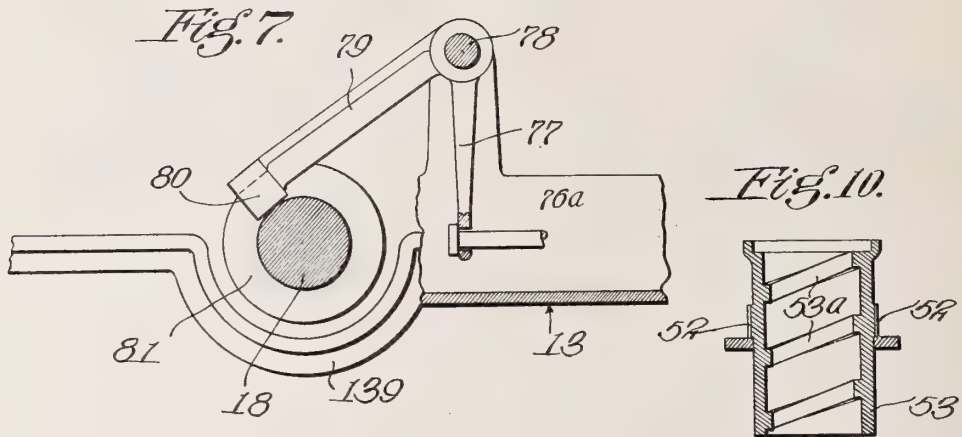
AUTOMATIC PHONOGRAPH.

APPLICATION FILED AUG. 15, 1911.

1,040,031.

Patented Oct. 1, 1912.

6 SHEETS—SHEET 6.



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# UNITED STATES PATENT OFFICE.

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AUTOMATIC PHONOGRAPH.

1,040,031.

Specification of Letters Patent.

Patented Oct. 1, 1912.

Application filed August 15, 1911. Serial No. 644,196.

*To all whom it may concern:*

Be it known that we, HARRY T. SCOTT and LEO J. PATTERSON, citizens of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented new and useful Improvements in Automatic Phonographs, of which the following is a specification.

This invention relates to improvements in our former devices, set forth in our applications Serial Nos. 605,881 and 629,892, filed February 1st, 1911 and May 27th, 1911, respectively; and particularly to a novel mode of securing the motion of the record carrying mandrel.

Whereas in both our former inventions there has been utilized a screw feed for the mandrel shaft, with various appurtenances for controlling this feed, in the present machine we provide for feeding the mandrel shaft by differential screw action on the shaft itself. As will be seen from the following specification, the mechanism for accomplishing this feeding action is very simple in its elements and combination, and each of the elements is of such design that the machine is less liable to wear, particularly having no small wearing parts.

In the invention as now constituted, there is first provided a mandrel shaft situated in vertical bearings so as to be rotatable and longitudinally translatable, a suitable screw thread being cut on the outside of the mandrel shaft. A rotatable nut engages with the shaft thread so that, by rotation of this nut, the shaft may be either raised or lowered, according to the direction of rotation. Means are provided for rotating the nut and the shaft at differential speeds, and for stopping and starting the rotation of the nut and shaft at different points in the operation of the machine. The direction of the mandrel screw thread in the present machine is such that, to feed the mandrel shaft downwardly by the differential action, the nut must be rotated slightly faster than the shaft itself; but it will be seen that, by suitable arrangements, this differential action might be exactly reversed. For driving the nut a simple gear mechanism is provided connecting the nut with a sleeve rotating about the shaft. This sleeve is loosely mounted on the

shaft and is rotatably connectible to the shaft through the means of another sleeve loosely keyed to the shaft and slidable thereon, the two sleeves having co-engaging means which may be slid into or out of engagement. The gears connect the first mentioned sleeve with the nut in such manner that the nut travels slightly faster than the sleeves; and arrangements are made for shifting these gears so as to throw them out of mesh and stop the rotation of the nut entirely. The sleeve rotates constantly, being driven directly from the fly-wheel of the machine which is driven by a suitable motor.

The nut and shaft rotate in the same direction; so that it will be seen that, if the arrangement is such that when the nut alone is revolving the shaft is moved downwardly, when the shaft alone revolves in the same direction it will be moved upwardly. The rate of these movements will depend entirely upon the speed of rotation of the nut and shaft and the pitch of the screw thread; and the pitch is made sufficiently coarse to cause the movement of the shaft at a comparatively high speed when either the nut or the shaft is rotated alone. But when the nut and shaft are rotated together, the differential action causes the slow downward movement of the shaft while it is rotated; and it is during this movement that the reproducing mechanism is thrown into engagement with the record to follow its sound groove. Thus, considered in a broad manner, the operation of the device is as follows: Mechanism controlled by the shaft when in its lowermost position causes the shaft to begin rotating. This immediately screws the shaft upwardly until it reaches its uppermost position. Mechanism controlled by the position of the shaft at its uppermost point causes the nut to begin revolving and the shaft is then moved down differentially while it is rotated. When the shaft has moved downwardly through a portion of its downward motion and the record on the mandrel has completely passed by the reproducing mechanism, mechanism is engaged by the shaft to stop the rotation of the shaft, the nut alone continuing in rotation. This causes the quick downward motion of the shaft to its original position. Means are



also provided for automatically feeding the record carrying table and for moving the reproducer into and out of engagement with a record; but these means do not enter  
5 broadly into the combination, entering only specifically when the mechanical details are considered.

In the accompanying drawings: Figure 1 is a perspective view showing the arrangement of the improved machine in a case.  
10 Fig. 2 is a vertical central section of the entire mechanism. Fig. 3 is an enlargement of certain portions shown in Fig. 2. Fig. 4 is a horizontal cross section taken on line 4—4 of Fig. 3. Fig. 5 is a vertical section taken on  
15 line 5—5 of Fig. 4. Fig. 6 is a segmental plan view, with parts in section, showing the arrangement of the top of the record carrying table and the registering means therefor. Fig. 7 is an enlarged fragmentary section  
20 taken on line 7—7 of Fig. 2. Fig. 8 is a horizontal section taken on line 8—8 of Fig. 3. Fig. 9 is a horizontal section taken on line 9—9 of Fig. 3. Fig. 10 is a central vertical  
25 section of the nut which engages the screw thread of the mandrel shaft.

In the drawings 5 designates a suitable case having a cover 6 beneath which record carrying table 7 is mounted, record 8 being  
30 placed in pocket 9 as in the devices of the former applications above referred to. This record carrying table is mounted on an upright table shaft 10 which is mounted in bearings 11 and 12 in main frame 13 of the  
35 machine. Frame 13 is of the general rectangular form illustrated in Fig. 2 and is secured to the case 5 in any suitable manner. Shaft 10 is so mounted that it is freely revoluble about its vertical axis to turn the  
40 table to present any particular record opposite the reproducing mechanism 15. This reproducing mechanism is mounted on a vertical shaft 16 in such a manner that the turning of the shaft will cause the move-  
45 ment of the mechanism toward or away from a record 8 carried on mandrel 17 of the machine. Mandrel 17 is mounted on the upper end of mandrel shaft 18 mounted in  
50 bearings 19 and 20 in frame 13. This mandrel shaft is revoluble and vertically movable along its longitudinal vertical axis and is provided with a screw thread 21 throughout a considerable portion of its length. It  
also is provided with a key-way 22.

Mounted around mandrel shaft 18 and situated in a bearing 25 in the lower part of frame 13 is a fly-wheel 26. This fly-wheel is driven by any suitable means, such as a  
60 belt 27 from a small motor 28 mounted on a heavy frame 29 which extends across the case and is of such weight as to efficiently absorb any of the motor vibrations and thus reduce to a minimum all noise within the case. Fly-wheel 26 has no direct rotational  
65 connection with mandrel shaft 18; it is

merely placed around the shaft on account of the convenience of this location. Situated directly above the fly-wheel 26 is a sleeve 30, loosely engaging the shaft and having  
70 gear teeth 31 thereon. This sleeve 30 is driven through the medium of an arm 32 which engages a notch 33<sup>a</sup> in the fly-wheel, the sleeve and gear teeth being thus driven directly with the fly-wheel. This sleeve has  
75 no direct rotational connection with the shaft, its connection with the shaft being through the medium of another sleeve 33 provided with a key 34 which engages in  
key-way 22 of mandrel shaft 18, the two sleeves being provided with co-engaging  
80 means 35 causing the revolution of sleeve 33 from sleeve 30. In the position shown in the drawings sleeve 33 is shown in its upper position so that it does not engage at all  
85 with sleeve 30. In this position the sleeve 33 and the mandrel shaft will not be rotated, sleeve 30 rotating alone. The means for raising sleeve 33 and for allowing it to drop into engagement with sleeve 30 will be hereinafter explained.

Located alongside mandrel shaft 18 is a counter shaft 40 mounted in suitable bearings 41 and 42. This shaft is both rotatable and slidable and carries on its lower end a  
90 gear 43 which engages with gear teeth 31 of sleeve 30 when gear 43 is in its upper position; but when the gear 43 is moved downwardly it will move out of engagement with gear teeth 31 and the rotation of gear 43  
95 and shaft 40 will cease. Directly above bearing 41 a large and small gear 45 and 46 are mounted together on a sleeve 47 loosely mounted on shaft 40. Gear 45 also meshes with teeth 31 of sleeve 30 and gear 46 drives  
100 a gear 48 which is a portion of the mechanism for automatically feeding the record carrying table. This mechanism will be later explained. Above bearing 42 of shaft 40 another gear 50 is mounted in an independent bearing 51. Gear 50 is not of the  
105 same diameter and number of teeth as gear 43, being, in this case, of slightly larger diameter and having a larger number of teeth. This gear 50 meshes with gear teeth 52 on nut 53; and the diameter of teeth 52  
110 being the same as that of teeth 31, it follows that the center of gear 50 will be slightly farther from the center of mandrel shaft 18 than is the center of gear 43. Thus, as gear 43 is directly mounted on shaft 40, the  
115 center of gear 50 must be set slightly eccentric to the center of shaft 40, and this is most conveniently done by providing the gear 50 with an independent bearing. The driving means provided between the gear 50  
120 and the shaft 40 are shown particularly in Figs. 3 and 8. A disk 55 is slidably keyed to shaft 40 (so as to allow the longitudinal movement of the shaft, as will be hereinafter explained) and this disk is provided  
130

with a slot and a hole 56 and 57 and with which pins 58 engage, the pins being rigidly mounted on gear 50. The slot 56 and hole 57 provide accommodation for the eccentric movement of the gear and the disk while they also provide for the driving of the gear from the disk in a practically uniform manner. It will be understood that this arrangement is only one of several possible arrangements for obtaining a differential drive between sleeve 30 and nut 53. In the present instance, it is desired during the differential movement of the shaft to move it downwardly  $\frac{1}{200}$  of an inch for each revolution. The screw thread 21 in the shaft has a one-half inch pitch, so that nut 53 is necessarily rotated  $\frac{1}{100}$  times faster than sleeve 30 and shaft 18. If the pitch of the thread in the mandrel shaft be changed, then the differential speed between the sleeve and nut may be changed. This differential speed rests entirely on the proportioning of the connecting gears; and it is conceivable that the sizes of the four different gears might be so arranged with suitable numbers of teeth so that gear 50 could be directly mounted on shaft 40. In this case it would probably be difficult to obtain a differential speed of  $\frac{1}{100}$  but, taking for instance that a differential speed of  $\frac{1}{25}$  could be easily obtained, the screw thread in the mandrel shaft could be so pitched that the shaft would be moved downwardly  $\frac{1}{200}$  of an inch for each revolution thereof. It is only on account of convenience as to size of gears and as to pitch of the screw thread that the present arrangement is adopted.

The means for sliding the counter shaft 40 is comprised in a leverage mechanism arranged above frame 13 and operated by a collar 60 secured on the mandrel shaft immediately below record mandrel 17. Collar 60 on reaching the position shown in the drawings contacts with lever 61 which is pivoted at 62 to the frame. Lever 61 is normally supported in the position shown by a spring 63. The upper end of shaft 40 is pivotally connected at 64 to lever 61 so that, when the lever is moved downwardly, the shaft will be moved downwardly to move gear 43 out of engagement with gear teeth 31. When this movement has been accomplished, the lever 61 is held in its lowermost position against the pressure of spring 63 by means of a catch 70 which engages over the upper surface of a collar 71 on a rod 72 attached to the end of lever 61. Catch 70 is formed on the end of a sliding rod 73 pressed by a spring 74 into engagement with rod 72 and collar 71. A lever 75 pivoted at 76 to frame 13 provides means for pulling catch 70 back out of engagement with collar 71 and for allowing spring 63 to then move lever 61 and shaft 40 upwardly to the position shown in Fig. 3. This lever 75 ex-

tends downwardly as is shown in Fig. 2 and is connected by an adjustable connecting rod 76<sup>a</sup> to a short arm 77 mounted on an upright shaft 78. This is shown in detail in Fig. 7. Also mounted on shaft 78 is an arm 79 having a member 80 on its end with which a collar 81 mounted on the lower end of mandrel shaft 18 is adapted to engage when the mandrel shaft is in its uppermost position. When the mandrel shaft reaches this uppermost position this collar 81 engages with member 80 and pushes it away from the shaft in the direction indicated in Fig. 7. This rotates arm 77 and moves connecting rod 76 longitudinally, causing the movement of lever 75 in the direction indicated in Figs. 2 and 3. This causes the withdrawal of catch 70 and allows shaft 40 and gear 43 to move upwardly under the impulse of spring 63. This again places gear 43 in engagement with gear teeth 31 of sleeve 30.

As before explained, gear 48 is driven from gear 46, gear 46 being of sufficient width to mesh with gear 48 when the gear 48 is raised from the position shown through a distance about equal to its own width. Gear 48 is loosely mounted on a slidable shaft 90 between two collars 91, so that the gear may revolve on the shaft and may be raised and lowered by moving the shaft vertically. This shaft is mounted in suitable bearings 92 and is raised by the mechanism about to be described, being lowered by its own weight. A yoke 93 is attached to the lower end of shaft 90, this yoke being for the purpose of passing around the edge of fly-wheel 26, and the lower end of the yoke is again attached to a rod 94 which passes downwardly to the lower part of the mechanism and rests in a cup 95 on the end of a small lever 96 pivoted at 97 to a bracket which rests on the case 5. The other end 98 of the lever is in the position to be pressed downwardly by the lower end of mandrel shaft 18 when the mandrel shaft reaches its lowermost position, so that rod 94 and shaft 90 and gear 48 are moved upwardly when the mandrel shaft reaches its lowermost position, as is shown in Fig. 5. Mounted on the upper face of gear 48 is a driving pin 100. A ratchet arm 101 projects over the upper face of gear 48 and is adapted to be moved in the direction indicated in Fig. 4 when engaged by the driving pin 100. The ratchet arm can only be engaged by the pin when the gear 48 is in its uppermost position, for when the gear 48 is lowered the driving pin 100 will pass beneath the ratchet arm. The ratchet arm is hinged at 102 so that its end may rise when pin 100 should happen to be raised directly under the end of the arm, thus obviating any liability of breakage of any parts. Ratchet arm 101 is provided with a sleeve 103 which loosely en-



circles table shaft 10 directly below bearing 11. A pawl 104 pivotally mounted on ratchet arm 101 engages with the teeth of ratchet wheel 105 rigidly mounted on shaft 10. The number of teeth in ratchet wheel 105 corresponds to the number of record pockets in the record carrying table; and the arrangement is such that the pin 100 imparts to arm 101 a sufficient movement to move the record carrying table through the distance corresponding to the distance between adjacent record pockets, bringing successive records opposite the reproducing mechanism. The means for registering the table exactly in position after it has been fed through an appropriate portion of a revolution is shown particularly in Fig. 6. The rim of the table is provided with a plurality of properly spaced apertures 110 which are engageable by a spring pressed ball 111 mounted at a convenient point on case 5. The spring pressed ball is mounted in the end of a tube 112 and a spring 113 forces it resiliently into engagement with the apertures. When the table is fed, the engagement of the ball with an aperture is sufficient to stop the table exactly in position; while the resistance imposed is easily overcome by the force with which the ratchet mechanism operates.

On ratchet arm 101 there is arranged a shoulder 120 which engages with a lug 121 on a small frame 122 just as the ratchet arm passes through the last portion of its movement and just as the table is coming into its correct position. This causes the frame 122 to move in the direction indicated in Fig. 4 and causes a rod 123 to move in the same direction, this rod being attached to the frame 122. Rod 123 is normally pressed in the direction opposite to that indicated by a spring 124. A yoke member 125 serves to pass the connection of rod 123 around the counter shaft 40 and rod 123<sup>a</sup> practically forms a continuation of rod 123 on the other side of the counter shaft. The end of this rod 123<sup>a</sup> engages with a spiral groove 126 in the periphery of sleeve 33. This groove 126 is so made that, when rod 123<sup>a</sup> is allowed to be spring pressed against the sleeve 33, the end of the rod will drop into the spiral groove and the rotation of the sleeve will then cause the sleeve to rise and to disengage the co-engaging means 35 and thus to sever its rotational connection with sleeve 30. When this occurs, shaft 18 also ceases rotation as it is keyed to sleeve 33. Rod 123 is prevented from moving in the direction opposite to that indicated, in the direction to allow ends 123<sup>a</sup> to engage with the spiral groove 126, by means of two detents 130 and 131 engaging with notches 132 and 133, respectively. Detent 131 is formed on the end of a rod 134 which is loosely connected

through a slot and pin 135 and 136 with lever 61, so that, when lever 61 is in its lower position, the detent 131 may drop into notch 133 when the notch passes under the detent. Detent 130 is formed on the upper end of a rod 137 which is normally pressed upwardly by a spring 138, so that detent 130 will engage notch 132 whenever notch 132 passes above it. The lower end of rod 137 is connected to the end of a lever 139 pivoted at 140 to the under side of frame 13 and having a depending portion 139<sup>a</sup> whose lower end is adapted to be engaged by collar 81 when the collar reaches the position shown in dotted lines in Fig. 2. The outward movement of end 139<sup>a</sup> of the lever causes the downward movement of the end connected to rod 137 and pulls the rod downwardly against the pressure of spring 138 and releases detent 130 from notch 132.

Having described in the main the mechanism of the present machine, we will now proceed to describe its operation, adding the description of the few remaining parts as the description of the operation progresses. Starting with the mandrel shaft in the position shown, and moving downwardly, it will be seen that lever 61 will first be pressed downwardly, moving shaft 40 downwardly and moving gear 43 out of engagement with gear teeth 31. This will immediately stop the rotation of shaft 40 and will therefore stop the rotation of nut 53. Nut 53 has spiral ribs 53<sup>a</sup> which engage with the screw thread of the shaft and the continued rotation of the shaft will cause its movement when the nut is stationary. But, with the machine in the position shown, the shaft is not rotated, the sleeve 33 having been raised out of engagement with the sleeve 30. Consequently, as soon as gear 43 is disengaged from gear teeth 31, the mandrel shaft will cease its downward motion. At the same time, when coming to its lowermost position, the lower end of the shaft engages with the end 98 of lever 96 and causes the upward movement of shaft 90 and gear 48. This causes feed pin 100 to come into contact with ratchet arm 101 which immediately causes the rotation of the record carrying table through, in this case,  $\frac{1}{12}$  of a revolution. Just as the table comes to its final position, the rod 123 is drawn in the direction indicated in the manner hereinbefore explained. Arm 61 being in its lowermost position, detent 131 is allowed to drop into notch 133 and detent 130 is also forced up into notch 132 by the action of its spring 138. Rod 123<sup>a</sup> is thus withdrawn from sleeve 33 and the sleeve allowed to drop and to engage with sleeve 30 which is constantly rotated. This immediately starts the rotation of shaft 18; but nut 53 is stationary, as gear 43 is still

in its lowermost position, being held in this position by the engagement of detent 70 with collar 71. The rotation of shaft 18 in the direction indicated thus causes the quick upward movement of the shaft.

5 When the shaft reaches its uppermost position the detent 70 is withdrawn from collar 71 and the lever 61 is allowed to be moved upwardly under the pressure of spring 63. This immediately moves the gear 43 up into

10 engagement with gear teeth 31, thus starting the rotation of nut 53. Nut 53 is rotated slightly faster than the shaft, so that the shaft is immediately fed downwardly by the differential action. At the same time

15 the reproducer is let into engagement with the record carried by the mandrel 17 by a means which will be hereinafter explained. When the mandrel has moved downwardly

20 through a distance corresponding to the length of the sound groove portion of the record, and has carried all of the sound groove past the reproducing point of the reproducing mechanism, then the collar 81

25 on the lower end of the shaft engages with the end 139<sup>a</sup> of lever 139 and causes the withdrawal of detent 130 from notch 132. Detent 131 having been previously withdrawn by the upward motion of lever 61,

30 the rod 123<sup>a</sup> is allowed to move into engagement with spiral groove 126 and the rotation of sleeve then immediately raises it to the position shown in Fig. 3. The nut 53 continues to revolve and thus to force the

35 shaft 18 downwardly until it reaches the position shown in Fig. 3, when the whole above described operation is repeated. The utility of detent 131 is this, that, on the upward movement of the mandrel shaft, the collar

40 81 will engage with the end 139<sup>a</sup> of lever 139 and will pull detent 130 out of engagement with its notch 132; but it is not desired to allow rod 123<sup>a</sup> to enter the spiral groove 126 at that time; and lever 61 being in its lower-

45 most position while the shaft is moving upwardly, the detent 131 will then prevent the movement of rod 123<sup>a</sup> into the spiral groove. Detent 130 will immediately move back into its notch 132 when the collar 81

50 has passed the lever end 139<sup>a</sup> and will hold the rod 123<sup>a</sup> from movement into the spiral groove when detent 131 is withdrawn by the upward movement of lever 61 when the shaft reaches its uppermost position.

55 The means for moving the reproducing mechanism is comprised in a spring 150 which tends to rotate shaft 16 in the direction indicated and in a means for holding the shaft from rotation in that direction except at the times when desired. To the

60 lower end of shaft 16 is attached an arm 151 whose end engages with a collar 152 on sleeve 33 and having a conical upper surface. When sleeve 33 moves upwardly, this

65 collar is moved in under the end of arm 151

and causes the rotation of shaft 16 in the direction opposite to that indicated. Sleeve 33 moves upwardly immediately a record has completely passed by the reproducing mechanism, and so by this movement the reproducing mechanism is moved away from

70 the record immediately the record has been completely reproduced; but the sleeve 33 moves downwardly again when the mandrel shaft reaches its lowermost position, and it

75 is not desired to move the reproducing mechanism into engagement with the record until the record has been completely raised to its uppermost position; in other words, until the mandrel shaft has again reached

80 its uppermost position. This is accomplished by means of a collar 155 on shaft 40 which engages with an arm 156 also mounted on the lower end of reproducer shaft 16

85 and holds the reproducer shaft against rotation in the direction indicated until shaft 40 moves upwardly when the mandrel shaft reaches the uppermost end of its stroke. Shaft 40 moves downwardly upon mandrel

90 shaft 18 reaching its lowermost position; while sleeve 33 does not move upwardly until the mandrel shaft has reached its lowermost position and the feeding operation has completely taken place. Consequently, collar

95 155 will catch arm 156 and hold it in the position shown in Fig. 3 before sleeve 33 moves downwardly and allows arm 151 to move inwardly. The reproducer shaft will thus be held from rotation in the direction indicated from the time the record has been

100 completely played till the time another record has been raised to its uppermost position ready for reproduction.

In Figs. 2 and 3 we have shown a means of supplying oil to the various mechanisms,

105 comprised in an oil distributing pipe or tube 200 into which oil is compressed by a small pump 201 arranged with a foot-piece 202 adapted to be pressed downwardly by the lower end of shaft 18 or by collar 81

110 when the shaft reaches its lowermost position. Each time the shaft passes to its lowermost position a certain amount of oil is pumped up from tube 200 and is distributed to nut 53 and to the bearing of disk 55

115 around shaft 40. From each of these points the oil passes downwardly along the shafts and oils all of the bearings thereon thoroughly. The oil is caught in a pan 205 in the lower part of the case below the mechanism, being pumped around through the machinery and renewed when dirty. We

120 have also shown a switch 204 attached to rod 94 in such manner that the switch will be in closed contact when the rod is in its lowermost position and will be raised out of contact when the rod is raised. In other words, the switch will be open when the

125 mandrel shaft is in its lowermost position. This switch may be connected in multiple

130



with a hand operated switch to control the motor as in the last one of our applications above referred to.

Having described our invention, we claim:

1. In a device of the character described, a record carrier adapted for movement along and rotation about a longitudinal axis, a helical screw thread on the record carrier about its axis, a nut engaging the screw thread, means to rotate the carrier, means to rotate the nut, and mechanism controlled by the position of the carrier to control the carrier rotating means and the nut rotating means.

2. In a device of the character described, a record carrier adapted for movement along and rotation about a longitudinal axis, a helical screw thread on the record carrier, a rotating member engaging the screw thread, means to rotate the carrier, means to rotate said member, and mechanism controlled by the position of the carrier to control the said member rotating means.

3. In a device of the character described, a record carrier adapted for movement along and rotation about a longitudinal axis, a helical screw thread on the record carrier, a rotating member engaging the screw thread, means to rotate the carrier, means to rotate said member, and mechanism controlled by the position of the carrier to control the carrier rotating means.

4. In a device of the character described, a record carrier adapted for movement along and rotation about a longitudinal axis, a helical screw thread on the carrier with its axis arranged longitudinally, a rotatable nut engaging the screw thread, means to rotate the carrier, means to rotate the nut at a speed differing from that of carrier rotation, and mechanisms controlled by the position of the carrier to control the carrier and nut rotating means.

5. In a device of the character described, a record carrier adapted for movement along and rotation about a longitudinal axis, a helical screw thread on the carrier about a longitudinal axis, a rotatable nut engaging the screw thread, means to rotate the carrier, means to rotate the nut at a speed differing from that of carrier rotation, whereby the carrier is given a longitudinal movement, means controlled by the movement of the carrier to one of its extreme positions to stop the nut rotating means and to start the carrier rotating means, means controlled by the movement of the carrier to its other extreme position to start the nut rotating means, and means controlled by the movement of the carrier to an intermediate position to stop the carrier rotating means.

6. In a device of the character described, a shaft adapted for movement along and rotation about a longitudinal axis, a helical screw thread on the shaft, a nut engaging

the screw thread, means to rotate the shaft, means to rotate the nut at a speed differing from that of the shaft, and mechanism controlled by the position of the shaft to control the nut and shaft rotating means.

7. In a device of the character described, a shaft rotatable and longitudinally translatable, a screw thread on the shaft, a rotatable nut engaging the screw thread, a rotating sleeve loosely mounted on the shaft, means to connect the sleeve rotatably to the shaft, connective means between the sleeve and the nut whereby the nut is rotated at a speed differing from the speed of sleeve rotation, whereby the shaft is given a longitudinal movement, and mechanism controlled by the position of the shaft to control the connective means between the sleeve and the nut.

8. In a device of the character described, a shaft rotatable and longitudinally translatable, a screw thread on the shaft, a rotatable nut engaging the screw thread, a rotating sleeve loosely mounted on the shaft, means to connect the sleeve rotatably to the shaft, connective means between the sleeve and the nut whereby the nut is rotated at a speed differing from the speed of sleeve rotation, whereby the shaft is given a longitudinal movement, and mechanism controlled by the position of the shaft to control the connective means between the sleeve and the shaft.

9. In a device of the character described, a shaft rotatable and longitudinally translatable, a screw thread on the shaft, a rotatable nut engaging the screw thread, a rotating sleeve loosely mounted on the shaft, means to connect the sleeve rotatably to the shaft, connective means between the sleeve and the nut whereby the nut is rotated at a speed differing from the speed of sleeve rotation, whereby the shaft is given a longitudinal movement, and mechanisms controlled by the position of the shaft to control the connective means between the sleeve and the shaft and the nut.

10. In a device of the character described, a shaft rotatable and longitudinally translatable, a screw thread on the shaft, a rotatable nut engaging the screw thread, a rotating sleeve loosely mounted on the shaft, another sleeve keyed to the shaft to slide thereon, inter-engaging means on the sleeves to rotatively connect them, gear connection between the first mentioned sleeve and the nut and adapted to be disconnected by shifting, and mechanisms controlled by the position of the shaft to slide the second mentioned sleeve out of engagement with the first mentioned sleeve, and to shift the gear connection between the first mentioned sleeve and the nut.

11. In a device of the character described, a shaft rotatable and longitudinally translatable and having a screw thread and a

longitudinal key-way, a rotatable nut engaging the screw thread, gear teeth on the periphery of the nut, a sleeve loosely mounted on the shaft and having gear teeth on its periphery, another sleeve on the shaft and engaging the key-way therein to be movable longitudinally of the shaft, said sleeves having co-engaging means causing the second mentioned sleeve to rotate from the first, a counter shaft approximately parallel to the first mentioned shaft, gears on the counter shaft engaging the gear teeth on the nut and sleeve, the gears being so proportioned that the nut and sleeve rotate at unequal speeds, means for shifting one of the counter shaft gears out of engagement with its meshing gear, said means being controlled in action by the position of the shaft, and mechanism controlled by the position of the shaft to move the second mentioned sleeve relatively to the first mentioned sleeve.

12. A device of the class described, comprising a record carrying mandrel, a shaft carrying the mandrel, said shaft being rotatable and longitudinally translatable and having a screw thread and a longitudinal key-way, a rotatable nut engaging the screw thread, gear teeth on the periphery of the nut, a sleeve loosely mounted on the shaft and having gear teeth on its periphery, another sleeve on the shaft and engaging the key-way therein to be movable longitudinally of the shaft, said sleeves having co-engaging means causing the second mentioned sleeve to rotate from the first, a counter shaft approximately parallel to the first mentioned shaft, gears on the counter shaft engaging the gear teeth on the nut and sleeve, the gears being so proportioned that the nut and sleeve rotate at unequal speeds, means for shifting one of the counter shaft gears out of engagement with its meshing gear, said means being controlled in action by the position of the shaft, mechanism controlled by the position of the shaft to move the second mentioned sleeve relatively to first mentioned sleeve, a reproducer mechanism adapted to engage a record carried by the mandrel and means whereby movement of the reproducer relative to the mandrel and record is caused by the movement of the said shifting counter shaft gear and by the longitudinal movement of the second mentioned sleeve.

13. A device of the class described, comprising a vertically journaled shaft, a circular record supporting table mounted on the upper end of the shaft, said table having a plurality of record holding pockets near its periphery, a vertical mandrel shaft mounted in bearings to revolve and slide vertically, a record engaging mandrel on the upper end of the shaft, the mandrel adapted to pass through the pockets in the record supporting table and engage with the rec-

ords therein, means to revolve the mandrel shaft, a screw thread mechanism whereby the revolution of the mandrel shaft serves to raise itself, means coöperating with said last named mechanism for feeding the mandrel shaft and mandrel downwardly from their uppermost position, means for intermittently rotating the record carrying table, said means including an actuating mechanism and a controlling mechanism adapted to be operated by the mandrel shaft when at its lowermost point of travel.

14. A device of the character described, comprising a record support, a record carrier adapted to move along and rotate about a longitudinal axis, means to rotate the carrier, means to cause a longitudinal movement thereof to remove a record from the support, another means coöperating with said last named means to cause another longitudinal movement of the carrier, and mechanisms controlled by the position of the carrier to control the operation of the means causing the longitudinal movement of the carrier.

15. A device of the character described, comprising a record support, a record carrier adapted to move along and to rotate about a longitudinal axis, means to rotate the carrier, a mechanism to cause the longitudinal movement of the carrier by virtue of its own rotation, another mechanism coöperating with said last named mechanism for causing the longitudinal movement of the carrier by virtue of its own rotation but in a ratio differing from that caused by the first mentioned mechanism, and means controlled by the position of the carrier to control the longitudinal movement mechanisms.

16. A device of the character described, comprising a record support, a record carrier adapted to move along and to rotate about a longitudinal axis, means to rotate the carrier, mechanism to cause the longitudinal movement of the carrier by virtue of its own rotation, another mechanism coöperating with the said last named mechanism to cause the longitudinal movement of the carrier by virtue of its own rotation but in ratio different and in a direction opposite that caused by the first mentioned mechanism, and means controlled by the position of the carrier to control the longitudinal movement mechanisms.

17. In a device of the character described, a record carrier adapted for longitudinal and rotary movement, means for rotating the carrier, means for causing a partial longitudinal movement of the carrier, means coöperating with said last named mechanisms for causing another partial movement of the carrier, and mechanisms controlled by the longitudinal position of the carrier to control both the said means for causing its longitudinal movement.



18. A device of the character described, comprising a record support, a record carrier adapted for movement along and rotation about a vertical axis, means for rotating  
5 the carrier, means for causing the record carrier to move upwardly to engage a record and move it from the record support, means coöperating with said last named mechanism for causing the carrier to move  
10 downwardly by virtue of its own rotation, and mechanisms controlled by the position of the carrier to control the means causing the carrier movements.

19. In a device of the character described,  
15 a record carrier adapted for longitudinal and rotary movement, means for moving the carrier longitudinally through a portion

of its movement, means coöperating with said last named means for rotating the carrier and simultaneously moving it through  
20 another portion of its movement, mechanisms controlled by the longitudinal position of the carrier to control both the said means, and manually operable means for the control of said carrier moving and rotating  
25 means.

In witness that we claim the foregoing we have hereunto subscribed our names this 8th day of August 1911.

HARRY T. SCOTT.  
LEO J. PATTERSON.

Witnesses:

JAMES T. BARKELEW,  
JAS. H. BALLAGH.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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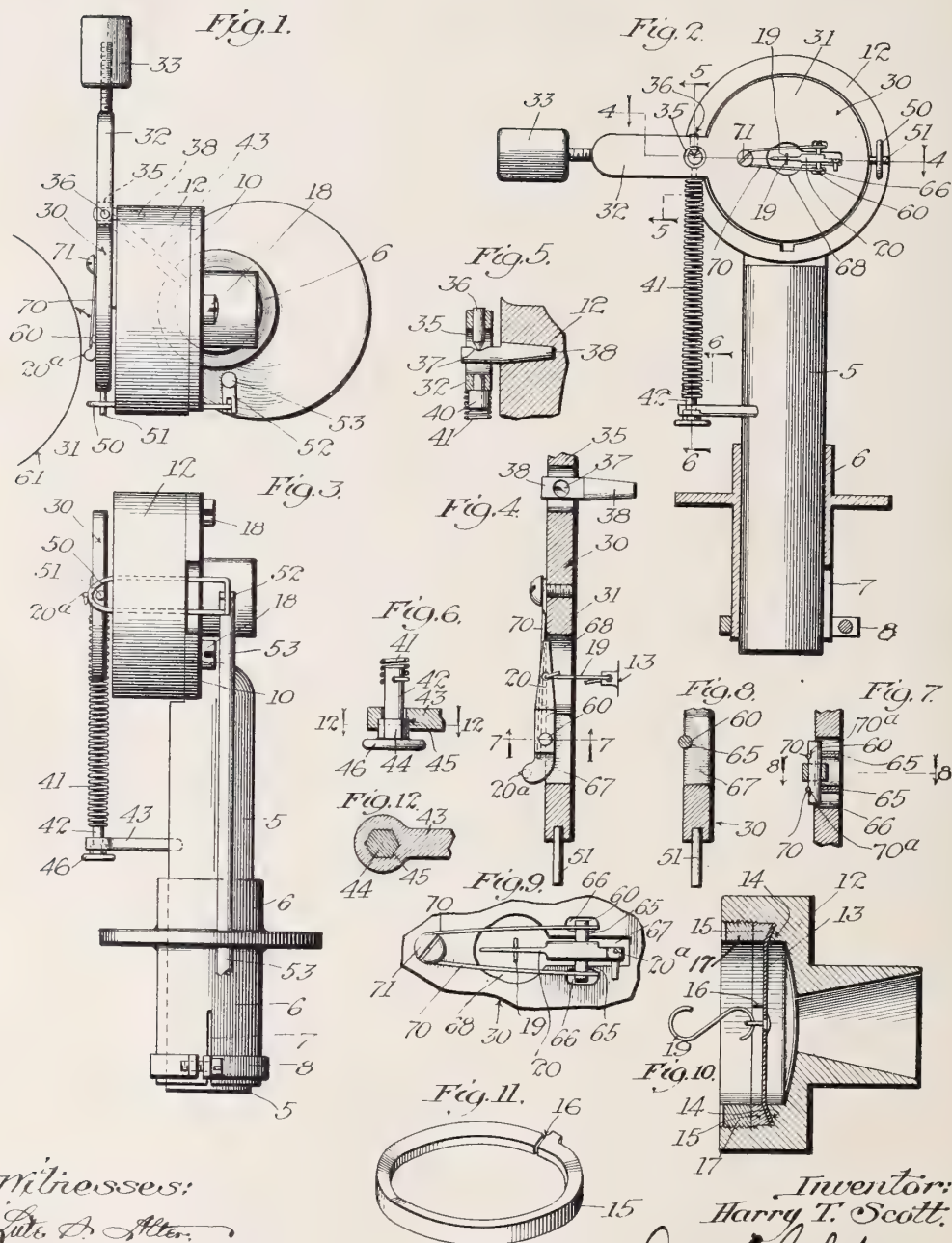


H. T. SCOTT.  
 PHONOGRAPH REPRODUCER.  
 APPLICATION FILED NOV. 21, 1911.

1,040,032.

Patented Oct. 1, 1912.

2 SHEETS—SHEET 1.



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H. T. SCOTT.  
 PHONOGRAPH REPRODUCER.  
 APPLICATION FILED NOV. 21, 1911.

1,040,032.

Patented Oct. 1, 1912.

2 SHEETS—SHEET 2.

Fig. 13

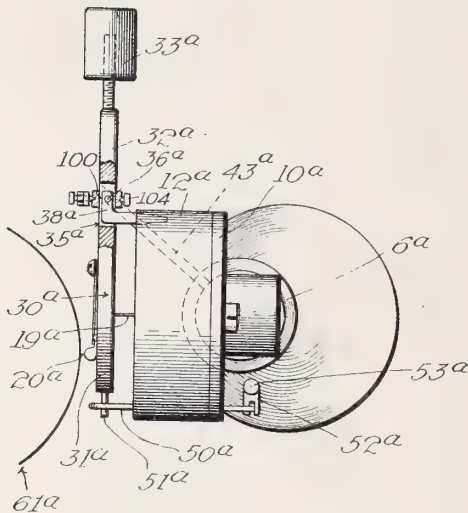


Fig. 14

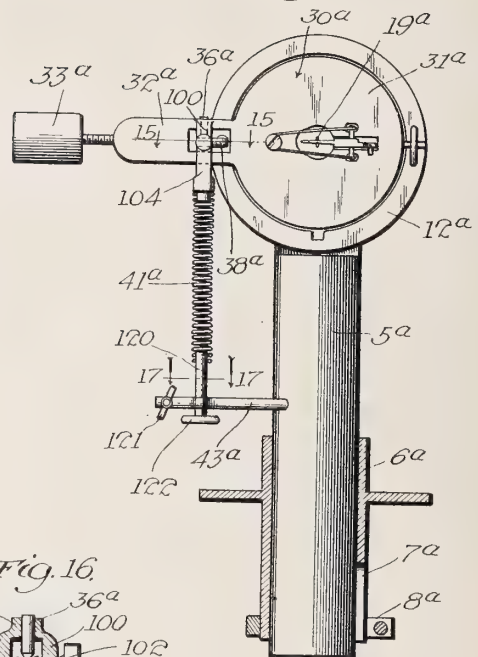


Fig. 15

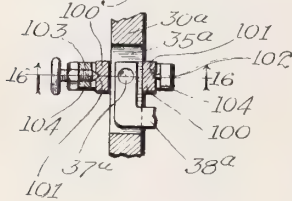


Fig. 16

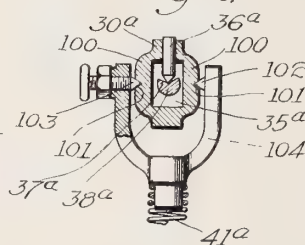
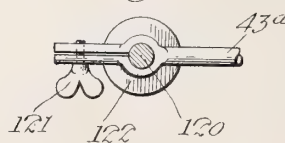


Fig. 17



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# UNITED STATES PATENT OFFICE.

HARRY T. SCOTT, OF LOS ANGELES, CALIFORNIA.

PHONOGRAPH-REPRODUCER.

1,040,032.

Specification of Letters Patent.

Patented Oct. 1, 1912.

Application filed November 21, 1911. Serial No. 661,485.

*To all whom it may concern:*

Be it known that I, HARRY T. SCOTT, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented new and useful Improvements in Phonograph-Reproducers, of which the following is a specification.

This invention relates to acoustic devices in general and to a phonograph reproducer in particular; and it has to do with certain improvements which render the reproducer more simple in construction and capable of giving better, cleaner and finer results than has heretofore been possible.

The prime object of my present invention is the elimination of all looseness of the working parts of a reproducer, together with the provision of a mechanism of such character that the reproducing point is allowed free movement in every direction. Following this primary object, my invention (as applied to the form of reproducer in which the stylus or reproducing point is mounted on a stylus plate and the stylus plate is in turn mounted on the sound box or other stationary frame) consists in a novel mounting for the stylus plate upon the sound box or stationary frame and in a novel mounting of the stylus upon the stylus plate. Broadly considered, the stylus may be mounted upon the stylus plate in any desired manner; my broader conception of invention including only my novel method of mounting the stylus plate, or other equivalent member which carries the stylus mounted thereon in any desired manner, upon the stationary box or frame. And this method of mounting the stylus plate fundamentally comprises what I term a single point suspension, the stylus plate only having a single point of engagement with the stationary supporting member and being more or less perfectly balanced on that point of engagement. In order to rotate the stylus plate about its vertical axis determined by this point of engagement, I employ a torsion spring which is attached to the stylus plate directly beneath the point of support and which acts about the vertical axis therethrough; and this same torsion spring also acts as a tension spring, if desired, to pull the stylus plate down into position so that it will not leave its point of support. The amount of tension depends entirely upon the weight of the stylus

plate itself. If the stylus plate is constructed rather heavily, its own weight is sufficient to hold it in place; if it is constructed more lightly, then the tension spring will be utilized.

The above outlined single point suspension of the stylus plate will be seen to eliminate all looseness and at the same time allow the stylus plate free movement in every direction. My method of mounting the stylus on the stylus plate also eliminates all looseness at that point. Preferably the stylus is provided with a vertical axis which rests in semi-cylindrical depressions in the stylus plate, and a small spring is utilized to press the axis into the depressions and hold it accurately in position.

There are other features of construction and combination which I wish to emphasize along with those above outlined, and which are more fully explained in the following specification and illustrated in the accompanying drawings, in which:

Figure 1 is a plan view of my improved device. Fig. 2 is a front elevation of the same. Fig. 3 is a side elevation of the same. Fig. 4 is an enlarged horizontal section taken on line 4—4 of Fig. 2. Fig. 5 is an enlarged vertical section taken on line 5—5 of Fig. 2. Fig. 6 is an enlarged section taken on line 6—6 of Fig. 2. Fig. 7 is a vertical section taken on line 7—7 of Fig. 4. Fig. 8 is a section taken on line 8—8 of Fig. 7. Fig. 9 is an enlargement of the portion of Fig. 2 showing the mounting of the stylus on the stylus plate. Fig. 10 is an enlarged cross section of the sound box of my improved device. Fig. 11 is a perspective view of a retaining ring for holding the vibrating diaphragm in the sound box. Fig. 12 is a section taken on line 12—12 of Fig. 6. Fig. 13 is a view similar to Fig. 1, showing a modified form of stylus plate mounting. Fig. 14 is a front elevation of the same. Fig. 15 is an enlarged detail section taken on line 15—15 of Fig. 14. Fig. 16 is a section taken on line 16—16 of Fig. 15. Fig. 17 is an enlarged detail taken as indicated by line 17—17 of Fig. 14.

In the drawings 5 designates a suitable upright supporting post which is adjustably mounted in a sleeve 6, so that the post may be moved vertically and rotated horizontally. The lower end of sleeve 6 is split at 7 and a small clamp 8 surrounds the sleeve



and serves to clamp it tightly about the upright 5. Upright 5 carries on its upper end a plate 10 to which a sound box 12 is secured, the box 12 being of ordinary construction except that I may vary the proportions to suit my own peculiar mechanism. Within this sound box 12 there is contained a diaphragm 13 of any desired material and formation, and the circular edge of the diaphragm is held between two rings 14 and 15 having inclined surfaces adjacent to each other and engaging with the peripheral portions of the diaphragm. Ring 14 is preferably solid while ring 15 is preferably divided at 16, as is best shown in Fig. 11; so that the ring 15 may be forced down on the diaphragm and force the diaphragm into the configuration shown, the ring 15 expanding slightly while being forced down along the inclined face of the two rings and pulling the edge of the diaphragm out with it, thus imparting to the diaphragm a tension in a radial direction. The ring 15 is held in place by means of a screw threaded ring 17 which is screwed into the sound box in the ordinary manner. The sound box itself is held on plate 10 by screws 18 or by any other suitable holding means. The diaphragm 13 has a connecting wire 19 which serves to connect with the stylus lever 20.

I have shown a stylus plate 30 which has the usual circular portion 31 immediately before the sound box 12 and which has an extension 32 carrying an adjustable counter-balance 33 on its end. At a point where the extension 32 joins the circular portion 31 there is provided an opening 35. A supporting pin 36 is mounted in a vertical position in the stylus plate and has a pointed end which, when counter-balance 33 is properly adjusted, is as closely as possible coincident with the center of gravity of the whole stylus plate. In order to insure good results from the reproducer, this condition must be approximately fulfilled; although variation of this point from the center of gravity along a vertical line therethrough does not impair the working quality as much as does displacement along a horizontal line through the center of gravity. The point of pin 36 rests in a shallow pointed depression 37 in a member 38 which is solidly mounted in a portion of box 12; but this member 38 may be mounted in any other stationary part of the mechanism. Immediately below the point of suspension of the stylus plate there is secured a pin 40 around which a torsion and tension spring 41 is soldered or otherwise secured. This spring 41 typifies, in the preferred form of device, any tension and torsion means and extends vertically downwardly directly beneath the point of suspension of the stylus plate and is secured at its lower end

to a vertical pin 42. This pin 42 passes through the end of an arm 43 and the pin is provided with an enlarged portion 44 of polygonal cross section which engages in an aperture 45 of similar section so that the pin 42 is prevented from turning. A small thumb nut 46 provides means for pulling pin 42 downwardly so that it may be rotated to put any desired torsion on the spring 41.

Spring 41 tends to move the stylus plate in the direction indicated by the arrow in Fig. 1; and the plate is prevented from moving excessively in that direction by means of a link 50 which passes around a pin 51 in the end of the stylus plate. This link 50 passes through the box 12 and is moved longitudinally from its rear end through the medium of an arm 52 mounted on the upper end of a vertical rod 53. This rod 53 is operated to move the stylus plate into and out of operative position; but the mechanism to effect this movement need not be entered into in this specification. Stylus 20 is pivotally mounted on a vertical axis 60 which is mounted on the stylus plate and held in engagement therewith in a novel manner. The stylus 20 moves about its pivot in a horizontal direction, and the stylus point 20<sup>a</sup> engages with a cylindrical record 61 which has its axis in a vertical position. Axis 60 of the stylus rests in two small approximately semi-cylindrical vertical grooves in the stylus plate, these grooves being designated by the numeral 65. It is desired that these grooves be not of great length, as it is more easily possible to make the axis 60 fit accurately when the grooves are short. But it is desirable to make the axis 60 somewhat longer than the grooves would provide for; and so the grooves are limited on their outer ends by apertures 66 which may pass completely through the stylus plate. The grooves are limited on their inner ends by the slot 67 in which the stylus 20 is placed, this slot 67 connecting with an enlarged aperture 68 in which the end of stylus 20 is located and through which the connection 19 passes. The axis 60 is held in place in the semi-cylindrical grooves 65 by means of a small double ended spring 70 secured by a screw 71 to the stylus plate. The ends of this spring press in notches 70<sup>a</sup> on the axis 60 and press it into the grooves; the engagement of the spring with the notches preventing endwise movement of the axis 60. The axis fits into the grooves accurately so that there is no looseness whatever. The stylus 20 is sufficiently loose in slot 67 to prevent it engaging with the edges of the slot.

With the stylus plate hanging in a vertical plane, as illustrated, and swinging horizontally into and out of engagement with the record, it will be seen that no part

of the weight of the stylus plate comes on the record at all. The only force tending to engage the stylus plate or the stylus with the record is the torsional force of the spring 41; and this may be adjusted as is desired.

In the form of reproducer in which the weight of the stylus plate is supported by the stylus resting upon the record, the weight of the stylus plate is limited very closely. On the weight and inertia of the stylus plate depends the efficiency of transmission of the sound vibrations from the stylus point to the vibrating diaphragm in the sound box. In my construction I may increase the weight of the stylus plate, and therefore its inertia as to movement about its single point of support, very greatly; and I am consequently enabled to decrease the vibrational movement of the stylus plate, to render the stylus plate more nearly stationary while still movable to follow any variations in the surface of the record due to eccentricity, and thus keep the vibrations more completely concentrated in the stylus and the connecting mechanism to the vibrating diaphragm. This is a feature of prime importance; and my method of single point suspension and of holding the stylus plate in place by the torsion and tension spring enables me to employ the methods and mechanisms just described.

In the foregoing described mechanism it will be seen that I have completely avoided all difficulties of the stylus point following any radial variation in the record, allowing the stylus point to move to and from the record without any interference by the weight of the stylus plate; in fact, the greater weight and inertia of the stylus plate rendering the operation more perfect. I also have devised a special means for minimizing or entirely obviating any tendency of the stylus point to vertical movement; that is, any tendency to movement along the record and parallel with its axis.

In the foregoing described mechanism it will be seen that the attachment of the spring 41 at a point at some distance from the point of support 35 will cause a certain tendency of the stylus plate to come back to the position shown in Fig. 2 if either end is raised or depressed. Thus, should the stylus point be lowered by any vertical movement of the record groove, there is immediately called into play a force tending to move the stylus point back to its horizontal position opposite the point of support 35. This vertical movement may be caused by variation in the sound groove on the record, or, as is more frequently the case where the record is supported vertically, it is caused by the gradual settling of the record on its cone shaped mandrel. There may then be some tendency for the stylus point to jump from one groove into

another and thus cause repetition or skipping in the reproduction. To obviate these possible difficulties I have shown a method whereby the spring 41 may be attached to the stylus plate at a point above or below the point of support 35 and as close thereto as is desired. By appropriately placing the point of attachment of the spring 41 the tendency to move the stylus point to its normal position may be lessened or increased. This mechanism is shown in Figs. 13 to 17. Here I have shown the aperture 35<sup>a</sup> in the stylus plate bridged by two webs 100 having pivot depressions 101 therein. In the present case I have shown these pivot depressions as being exactly opposite the point of support where pointed pin 36<sup>a</sup> rests in depression 37<sup>a</sup> in member 38<sup>a</sup>. Member 38<sup>a</sup> is bent so as to enter into the space between the two webs 100; but this construction may be as desired. Engaging with pivot depressions 101 is a pair of pivot points 102 and 103 mounted on a yoke 104. Pivot point 103 is adjustable so that the bearings may be kept in best working order. The spring 41<sup>a</sup> is attached to the lower end of yoke 104 so that both torsion and tension may be transmitted therethrough. Where the spring is thus attached to the stylus plate it will be seen that the downward tension of the spring will have absolutely no tendency whatever to move the stylus plate in a vertical plane about its point of support, the only tendency of the downward pull being to hold the pin 36<sup>a</sup> in its depression 37<sup>a</sup>. If the pivot points 102 and 103 are placed slightly below the point of support, then there will be only a slight tendency to bring the stylus point back to its normal position. The pivot points may be placed above the point of support if desired; and this placement may be used to counteract the tendency of the connecting wire 19<sup>a</sup> which always tends to bring the stylus plate back to its normal position, co-acting with spring 41 acting in torsion. The lengthening of this connection 19<sup>a</sup>, as shown in Fig. 13, tends to lessen the tendency for this action to bring the stylus plate back to its normal position as regards vertical movement. With this mechanism it will be seen that the relative positions of the point of support of the stylus plate and the point of attachment of spring 41<sup>a</sup> may be varied to suit any particular condition; and on account of this variability I do not wish to limit myself to any specific point of connection of the spring to the stylus plate.

In Fig. 17 I have shown a modified means of securing the lower end of spring 41<sup>a</sup>, consisting of a small rod 120 to which the lower end of the spring is attached for both torsion and tension, this rod being clamped in the split end of bar 43<sup>a</sup> by means of a small thumb screw 121. A small thumb



nut 122 on the lower end of the rod 120 provides means for turning the rod and for moving it longitudinally as desired.

Having described my invention, I claim:

5 1. In an acoustic mechanism, a stationary frame, a vibrating member thereon, a stylus plate, a stylus thereon and connected to the vibrating member, a supporting member on the frame, a supporting member on the stylus  
10 plate and engaging the first named supporting member at a single point, said point of engagement being approximately coincident with the center of gravity of the stylus plate, and a torsion and tension member  
15 acting downwardly and rotatively on the stylus plate along and about a vertical line passing through said point of engagement.

2. In an acoustic mechanism, a stationary frame, a vibrating member thereon, a stylus  
20 plate, a stylus thereon and connected to the vibrating member, a supporting member on the frame, a supporting member on the stylus plate and engaging the first named supporting member at a single point, said  
25 point of engagement being approximately in a vertical line through the center of gravity of the stylus plate, and a torsion and tension member acting downwardly and rotatively on the stylus plate along and about  
30 the said line determined by the center of gravity.

3. In an acoustic mechanism, a stylus plate mounting comprising a stationary member, and a supporting member on the stylus  
35 plate and engaging the stationary member at a single point, said point of engagement being approximately on a vertical line determined by the center of gravity of the stylus plate.

4. In an acoustic mechanism, a stylus plate mounting comprising a stationary member, a supporting member on the stylus plate and engaging the stationary member at a single  
40 point, said point of engagement being approximately on a vertical line determined by the center of gravity of the stylus plate, and a torsion and tension member acting on the stylus plate about and along the said  
45 line determined by the center of gravity.

5. In an acoustic mechanism, a stylus plate mounting comprising a stationary member, a supporting member on the stylus plate and engaging the stationary member at a  
50 single point, said point of engagement being approximately on a vertical line determined by the center of gravity of the stylus plate, and a torsion and tension spring attached to the stylus plate and extending down-  
55 wardly directly beneath the said point of engagement and being stationarily fixed on its lower end.

6. An acoustic mechanism, comprising a stationary sound box, a vibrating member therein, a stylus plate, a mounting for the  
65 stylus plate on the sound box and compris-

ing coöperating members on the box and plate, the plate member resting on the box member at a single point of engagement, torsion and tension means acting on the  
70 plate about and downwardly along the vertical line passing through the said point of engagement, a stylus pivotally mounted on the plate, and connecting means between the stylus and the vibrating member in the sound box.

7. An acoustic mechanism, comprising a stationary sound box, a vibrating member therein, a stylus plate, a mounting for the stylus plate on the sound box and compris-  
80 ing coöperating members on the box and plate, the plate member resting on the box member at a single point of engagement, torsion and tension means acting on the plate about and downwardly along the vertical line passing through the said point of  
85 engagement, a stylus having a vertical axis, the stylus plate having depressions adapted to receive the stylus axis, spring means for holding the stylus axis in said depressions, and a connection between the stylus and the  
90 vibrating member in the sound box.

8. In an acoustic mechanism, a stylus plate mounting comprising a stationary member, a supporting member on the stylus plate and engaging the stationary member at a single  
95 point, said point of engagement being approximately at the center of gravity of the stylus plate, and a torsion and tension spring attached to the stylus plate approximately at the center of gravity of the stylus plate. 100

9. In an acoustic mechanism, a stylus plate mounting comprising a stationary member, a supporting member on the stylus plate and engaging the stationary member at a single  
105 point, said point of engagement being approximately at the center of gravity of the stylus plate, a yoke pivotally attached to the stylus plate horizontally opposite the center of gravity thereof, and a tension and torsion spring attached to the lower part of the  
110 yoke.

10. In an acoustic mechanism, a stylus plate mounting comprising a stationary member having a pivot depression therein, a pin on the stylus plate having a pointed  
115 end resting in said depression, the point of support thus formed approximately coinciding with the center of gravity of the stylus plate, a yoke pivoted to the stylus plate on a horizontal axis passing approxi-  
120 mately through said center of gravity, the yoke depending below the stylus plate, and a torsion and tension spring attached to the lower portion of the yoke and acting in torsion and tension about and along a vertical  
125 line passing through the axis on which the yoke is connected to the stylus plate.

11. In an acoustic mechanism, a stylus plate mounting comprising a stationary member having a pivot depression therein, a 130

pin on the stylus plate having a pointed end resting in said depression, the point of support thus formed approximately coinciding with the center of gravity of the stylus plate, 5 a yoke pivoted to the stylus plate on a horizontal axis passing approximately through said center of gravity, the yoke depending below the stylus plate, and a torsion and tension spring attached to the lower portion of 10 the yoke and acting in torsion and tension about and along a vertical line passing through the point of support of the stylus plate.

12. In an acoustic mechanism, a stationary frame, a stylus carrying member, co- 15 operating supporting members on said member and the frame and having but a single point of contact, and a torsion spring attached to the said member and acting about 20 a vertical axis determined by said point of contact.

13. In an acoustic mechanism, a stationary frame, a stylus carrying member, co-

operating supporting members on the said member and frame and having but a single 25 point of contact approximately in a vertical line through the center of gravity of said member, and a torsion and tension spring acting downwardly and rotatively on said member approximately along and about the 30 said line determined by the center of gravity.

14. In an acoustic mechanism, a stationary member, a stylus plate, coöperating support members on the stationary member and plate engaging each other at but a single 35 point of contact, and yielding means acting along the vertical axis determined by said point of support to move the stylus plate horizontally about the said point of support.

In witness that I claim the foregoing I 40 have hereunto subscribed my name this 13th day of November 1911.

HARRY T. SCOTT.

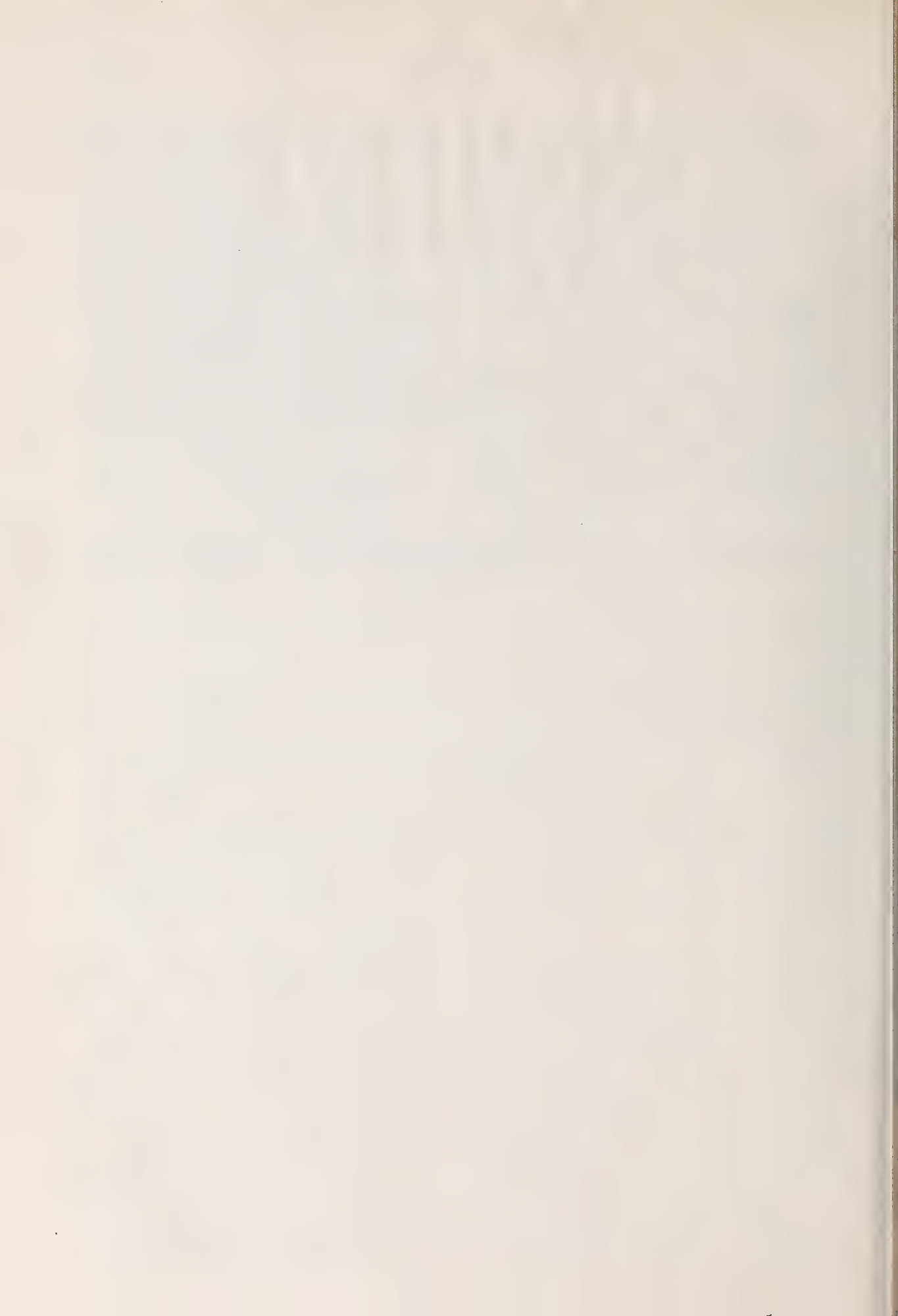
Witnesses:

JAMES T. BARKELEW,  
JAS. H. BALLAGH.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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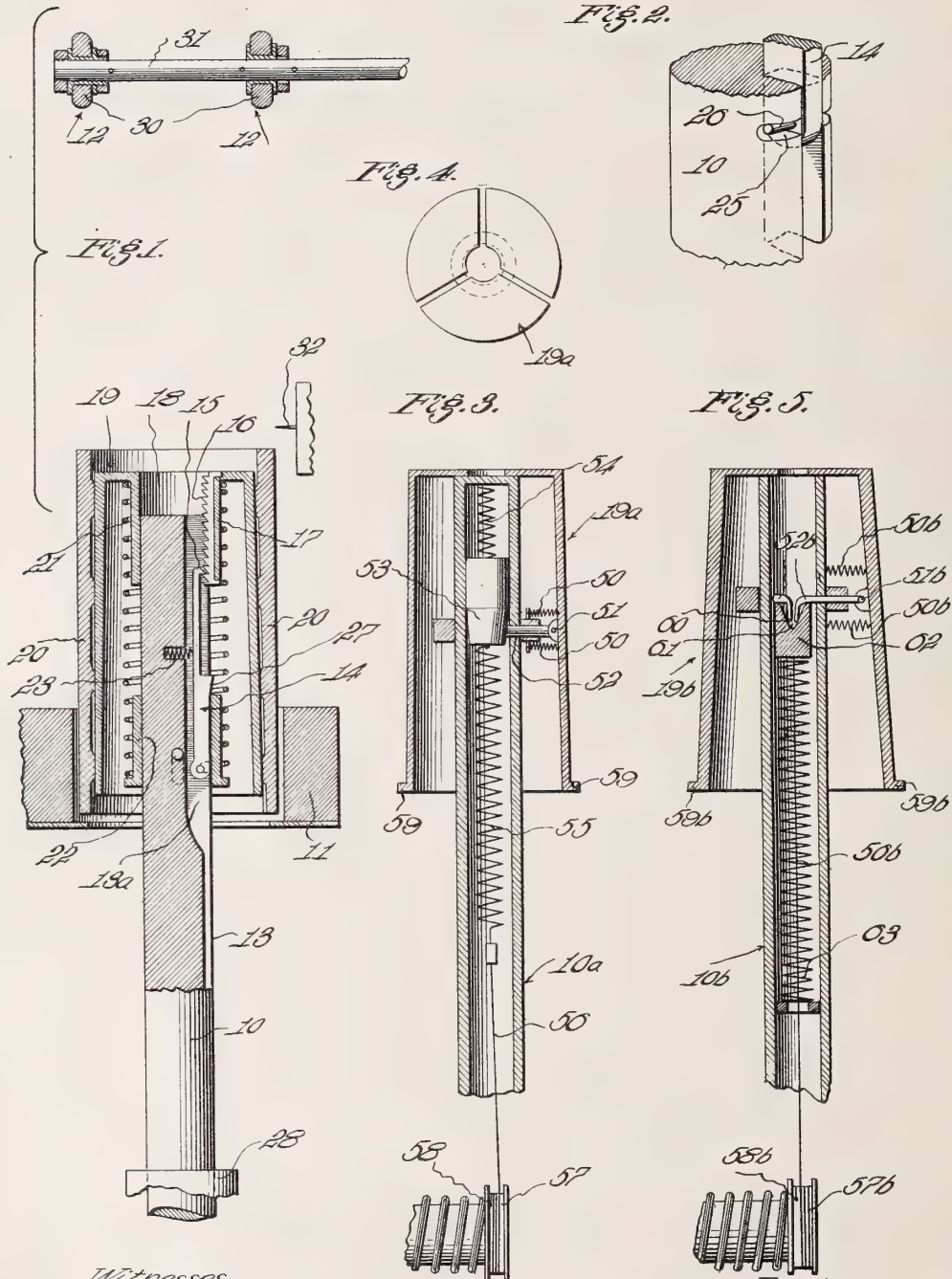




H. T. SCOTT.  
 PHONOGRAPH MANDREL.  
 APPLICATION FILED FEB. 7, 1912.

1,040,033.

Patented Oct. 1, 1912.



Witnesses.  
 Edward H. Barkley  
 B. L. L. L. L.

Inventor,  
 Harry T. Scott,  
 by James T. Barkley  
 his Attorney.

# UNITED STATES PATENT OFFICE.

HARRY T. SCOTT, OF LOS ANGELES, CALIFORNIA.

## PHONOGRAPH-MANDREL.

1,040,033.

Specification of Letters Patent.

Patented Oct. 1, 1912.

Application filed February 7, 1912. Serial No. 676,079.

*To all whom it may concern:*

Be it known that I, HARRY T. SCOTT, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented new and useful Improvements in Phonograph-Mandrels, of which the following is a specification.

This invention relates to an adjustable phonograph mandrel whereby a phonograph record thereon may be accurately placed in longitudinal position relative to the reproducing point.

In automatic phonographs it has heretofore been somewhat difficult to place the record and the reproducing point always in such relation that the point would immediately engage the sound groove of the record and begin reproduction; and this trouble has been mainly caused by variation of fitting of the records upon the mandrel caused by heat expansion, contraction and warping of the records. For instance, with the mandrel and reproducing point in certain relation to each other, one certain record will fit on to the mandrel so far that its beginning sound groove is far to one side of the reproducing point, while another record will fit so tightly on the mandrel that its beginning sound groove will be quite a distance on the other side of the reproducing point. To allow for this variation it has heretofore been necessary to leave considerable space between the beginning sound groove and the reproducing point; and this has necessitated in the average case a long rotation and travel of the record before reproduction begins.

In this present invention it is my aim to produce such a mandrel construction as will allow the record to be carried to a certain predetermined point relative to the reproducing needle irrespective of how that record fits upon the mandrel. This object may be accomplished in different manners; and I have illustrated several mechanisms in the accompanying drawings. But my preferred form of apparatus involves a mandrel which is slidable upon the mandrel shaft and which is spring pressed in one direction and normally held by a ratchet mechanism from movement in that direction. Means are provided to engage with a record and to thereby both press the record on the mandrel and move the mandrel against the spring pressure to such a point

as will accurately place the record in position before the reproducing needle. Releasing means are also employed to loosen the ratchet mechanism and allow the whole device to come back to its normal position.

The details of this construction may be greatly varied; but I will explain in the following specification a form of device which is eminently practical, this form and others being illustrated in the accompanying drawings, in which:

Figure 1 is a longitudinal section of the preferred form of my device. Fig. 2 is a perspective view illustrating a detail of construction of the form shown in Fig. 1. Fig. 3 is a longitudinal section of a modified form. Fig. 4 is a plan view of the same. Fig. 5 is a longitudinal section of a further modified form.

Referring now particularly to Figs. 1 and 2 of the drawings, 10 designates a suitable mandrel shaft which, in the form of machine to which I particularly propose to apply this present invention, is longitudinally vertically movable. But it will be seen from the following that this movement is relative only to the other portions of the mechanism; it will be apparent that it will suffice for the shaft 10 and the record support 11 and the record engaging stops 12 to be relatively movable. However, I will explain the device as it operates with the record support 11 and stops 12 stationary and with the shaft 10 moving vertically. Shaft 10 has a key-way 13 in its upper end, enlarged at 13<sup>a</sup> to receive a pivoted pawl 14 having its upper or pawl end 15 engageable with ratchet teeth 16 on a ratchet bar 17 mounted in bore 18 of mandrel 19. The mandrel 19 is adapted to carry a record and is vertically slidable on the shaft 10. A suitable spring 21 supports the mandrel, the lower end of the spring resting on a collar 22 which is also limitedly slidable on the shaft 10. The spring 21 normally keeps the mandrel in its upper position and the sleeve 22 in its lower position, the upward movement of the mandrel being stopped by the pawl 14. Pawl 14 is pressed outwardly by a small spring 23, and its lower portion is within the sleeve 22. The method of pivotally mounting the pawl 14 on the shaft 10 is shown in detail in Fig. 2. A transverse slot 25 is cut in the shaft 10 and a pin 26 attached to the pawl 14 rests in the slot



25. The pawl is prevented from moving out by the sleeve 22. Immediately above the upper edge of the sleeve 22 the pawl is provided with an outwardly inclined face  
5 27 of such nature that the pawl will be moved inwardly and disengaged from ratchet teeth 16 when the sleeve 22 is moved upwardly. Means for moving the sleeve 22 upwardly is provided by a stop 28 station-  
10 arily mounted around the shaft 10 and engageable by the sleeve 22 when the shaft 10 moves downwardly. This forms a specific preferred form of release for the ratchet mechanism; but I do not care to limit my-  
15 self to this peculiar form nor to the specific time of release hereinafter described.

The record engaging stops 12 preferably comprise suitable rollers 30 revolvably mounted on a shaft or rod 31 which may  
20 be supported in any preferred manner. A reproducing point 32 is illustrated in Fig. 1.

In operation, the shaft 10 moves from a position below that illustrated in Fig. 1 and the mandrel 19 is moved up inside a record  
25 20 which has been supported on table 11 and raises the record off the table, carrying it upwardly until the upper edge of the record is pressed against the wheels 30. Further upward movement of the shaft then causes  
30 the record to be pressed down on the mandrel so as to properly engage the same and causes the relative downward movement of the mandrel on the shaft. In other words, the record is held in proper position relative  
35 to the reproducing point while the mandrel adjusts itself on the shaft. Rotation of the shaft then begins and the reproducing point will immediately engage the beginning of the sound groove and start the reproduction.  
40 When the reproduction has been finished, the mandrel shaft is moved downwardly and the ratchet mechanism released in the manner hereinbefore described. The mandrel thereupon moves upwardly and is in  
45 readiness for the next operation.

In Figs. 3, 4 and 5 I have shown modified forms of device for properly placing the record with relation to the reproducing point. Here I have shown an expanding  
50 mandrel 19<sup>a</sup> or 19<sup>b</sup> constructed in a number of segments. In the form shown in Figs. 3 and 4 each segment is pulled inwardly toward hollow shaft 10<sup>a</sup> by suitable springs 50, the segment being pivotally sup-  
55 ported at 51 on a small plunger 52. The inner ends of the plungers are engaged by a suitable cone 53 normally supported in the position shown by a light spring 54. Below the cone 53 a heavier spring 55 con-  
60 nects the cone with a suitable cord 56 which may wind about a flat take-up drum 57, the end of the cord being secured to the drum at 58. When the shaft 10<sup>a</sup> has moved upwardly sufficient to unwind the whole length  
65 of cord 56, the cord will then pull down

on heavy spring 55 and will move the cone 53 down between the ends of plungers 52, causing the expansion of the segmental mandrel. The record has meanwhile been resting  
70 loosely around the mandrel on shoulder 59, the shoulder providing for accurate longitudinal placement of the record.

In Fig. 5 I have shown a slightly different form of device in which each segment is supported pivotally and adjustably at the  
75 point 51<sup>b</sup> on plungers 52<sup>b</sup>, but these plungers have downwardly depending inner ends 60 engaging a conical aperture 61 in a movable member 62 ordinarily supported in the position shown by a suitable compression spring  
80 63. The member 62 is connected to a cord 56<sup>b</sup> operated in the same manner as cord 56. Springs 50<sup>b</sup> hold the segments inwardly, but only with slight force, so that centrifugal force of the revolving segments will over-  
85 come the springs and force the segments outwardly into proper engagement with the inner surface of a record supported on the flange 59<sup>b</sup>. When the shaft 10<sup>b</sup> moves upwardly to a sufficient height, the cord 56<sup>b</sup>  
90 draws down on the member 62 causing plungers 52 to be loosened so that the segments may move outwardly by centrifugal action.

Having described my invention, I claim:

1. In combination, a longitudinally movable mandrel carrying member, a record carrying mandrel longitudinally movable thereon, and stationary means into engagement with which a record on the mandrel is  
95 moved by the common movement of carrying member and mandrel, whereby the mandrel and record are moved longitudinally on the carrying member.

2. In combination, a mandrel shaft, a record carrying mandrel slidable thereon,  
105 yielding means to move the mandrel in one direction on the shaft, releasable means to secure the mandrel against such movement, and means adapted to engage a record on the mandrel and cause the mandrel to move on  
110 the shaft.

3. In combination, a mandrel shaft, a record carrying mandrel slidable thereon, yielding means to move the mandrel in one  
115 direction on the shaft, ratchet holding means for the mandrel, and means adapted to engage a record on the mandrel and cause the movement of the mandrel on the shaft.

4. In combination, a longitudinally movable mandrel carrying member, a record carrying mandrel longitudinally movable thereon, means for opposing movement of the mandrel on the carrying member, and stationary means into engagement with  
120 which a record on the mandrel is moved by the common movement of carrying member and mandrel, whereby the mandrel and record are moved longitudinally on the carrying member.

5. In combination, a mandrel shaft, a rec- 130

ord carrying mandrel slidable thereon, yielding means to move the mandrel in one direction on the shaft, releasable means to secure the mandrel against such movement, means for releasing the mandrel securing means, and means adapted to engage a record on the mandrel and cause the mandrel to move on the shaft.

6. In combination, a mandrel shaft, a record carrying mandrel slidable thereon, yielding means to move the mandrel in one direction on the shaft, ratchet holding means for the mandrel, means for releasing said ratchet holding means, and means adapted to engage a record on the mandrel and cause the movement of the mandrel on the shaft.

7. In combination, a longitudinally movable mandrel shaft, a record carrying mandrel longitudinally movable thereon, a spring tending to move the mandrel in one direction on the shaft, a ratchet mechanism holding the mandrel against such movement, a stop adapted to be engaged by a record on the mandrel, and means for releasing the ratchet mechanism.

8. In combination, a longitudinally movable mandrel shaft, a record carrying mandrel longitudinally movable thereon, a collar limitedly slidable on the mandrel shaft, a spring between the mandrel and collar tending to move the mandrel in one direction on the shaft, ratchet mechanism preventing such movement of the mandrel, said mechanism including a pawl movable by longitudinal movement of the collar, a stop adapted to be engaged by a record on the mandrel, and a stop adapted to be engaged by the collar.

9. In combination, a vertically longitudinally movable mandrel shaft, a record carrying mandrel longitudinally movable thereon at its upper end, a collar limitedly slidable on the shaft below the mandrel, a compression spring between the mandrel and collar, ratchet teeth on the mandrel, a pawl pivoted on the shaft and engageable with said ratchet teeth and having an inclined surface engageable by the sleeve in its up-

ward movement, a record stop above the mandrel, and a stop below the collar. 50

10. In combination, a vertically longitudinally movable mandrel shaft, a record carrying mandrel longitudinally movable thereon at its upper end, a collar limitedly slidable on the shaft below the mandrel, a compression spring between the mandrel and collar, a ratchet toothed bar on the mandrel adjacent the shaft, a pawl pivoted to the shaft and lying within a longitudinal groove therein with its lower end within the collar, an outwardly projecting inclined surface on the pawl directly above the collar, a spring tending to move the pawl outwardly, a record stop above the mandrel, and a stop below the collar. 55 60 65

11. In combination, a vertically longitudinally movable mandrel shaft, a mandrel slidable thereon, spring means for moving the mandrel upwardly on the shaft, and ratchet means to prevent such movement. 70

12. In combination, a vertically longitudinally movable mandrel shaft, a record carrying mandrel slidable thereon, spring means for moving the mandrel upwardly on the shaft, ratchet means to prevent such movement, and a record stop above the mandrel. 75

13. In combination, a vertically longitudinally movable mandrel shaft, a record carrying mandrel slidable thereon, spring means for moving the mandrel upwardly on the shaft, ratchet means to prevent such movement, releasing means for said ratchet means, and a record stop above the mandrel.

14. In combination, a mandrel shaft, a mandrel slidable thereon, spring means for moving the mandrel in one direction on the shaft, and ratchet mechanism to prevent such movement.

In witness that I claim the foregoing I have hereunto subscribed my name this 31st day of January, 1912.

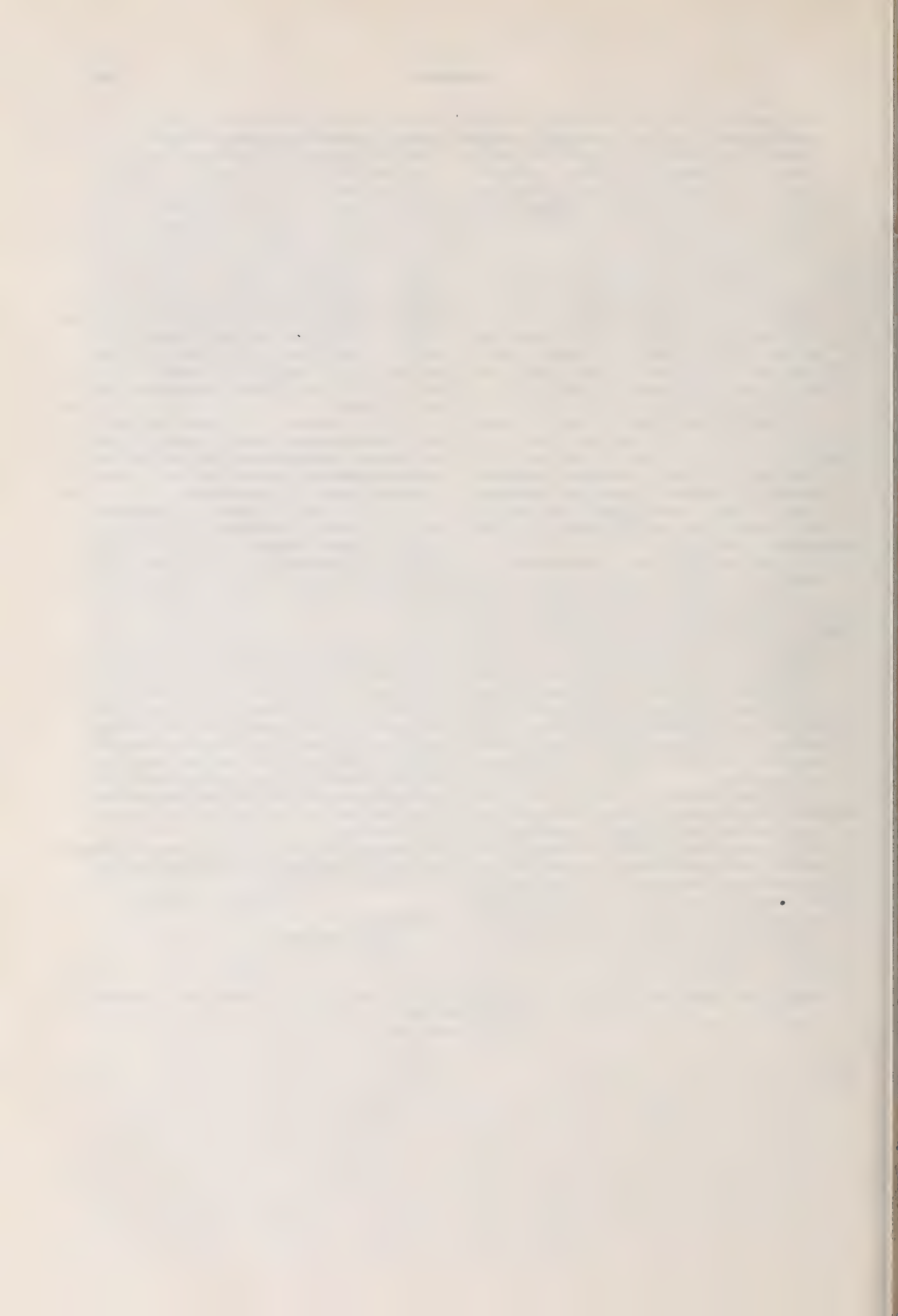
HARRY T. SCOTT.

Witnesses:

JAS. H. BALLAGH,

JAMES T. BARKELEW.







H. T. SCOTT & L. J. PATTERSON.

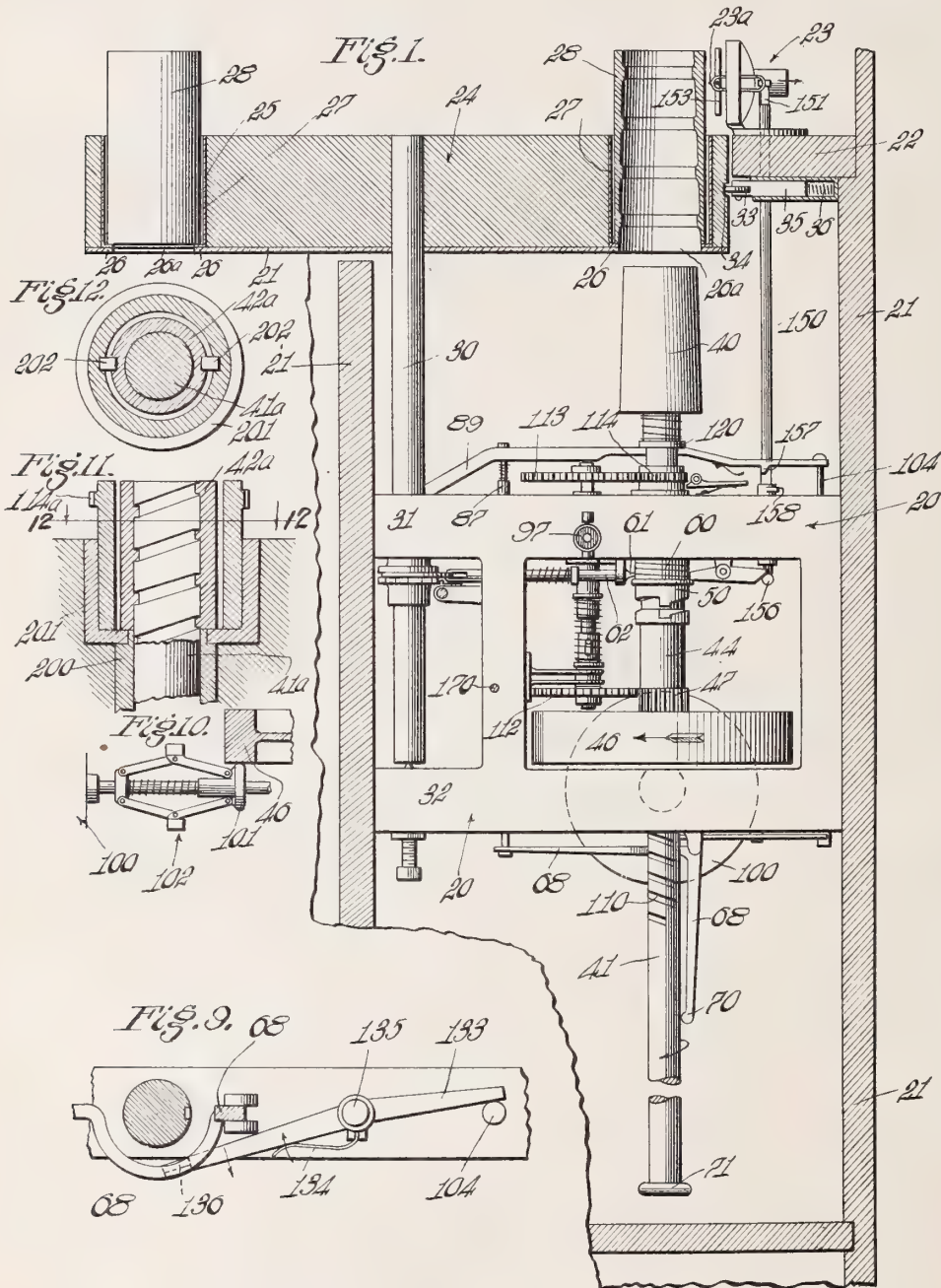
AUTOMATIC PHONOGRAPH.

APPLICATION FILED APR. 11, 1912.

1,040,034.

Patented Oct. 1, 1912.

3 SHEETS—SHEET 1.



Witnesses.  
Edward H. Calkins  
E. L. Lacey

Inventors,  
Harry T. Scott and  
Leo J. Patterson,  
by James T. Backe  
their Attorney.



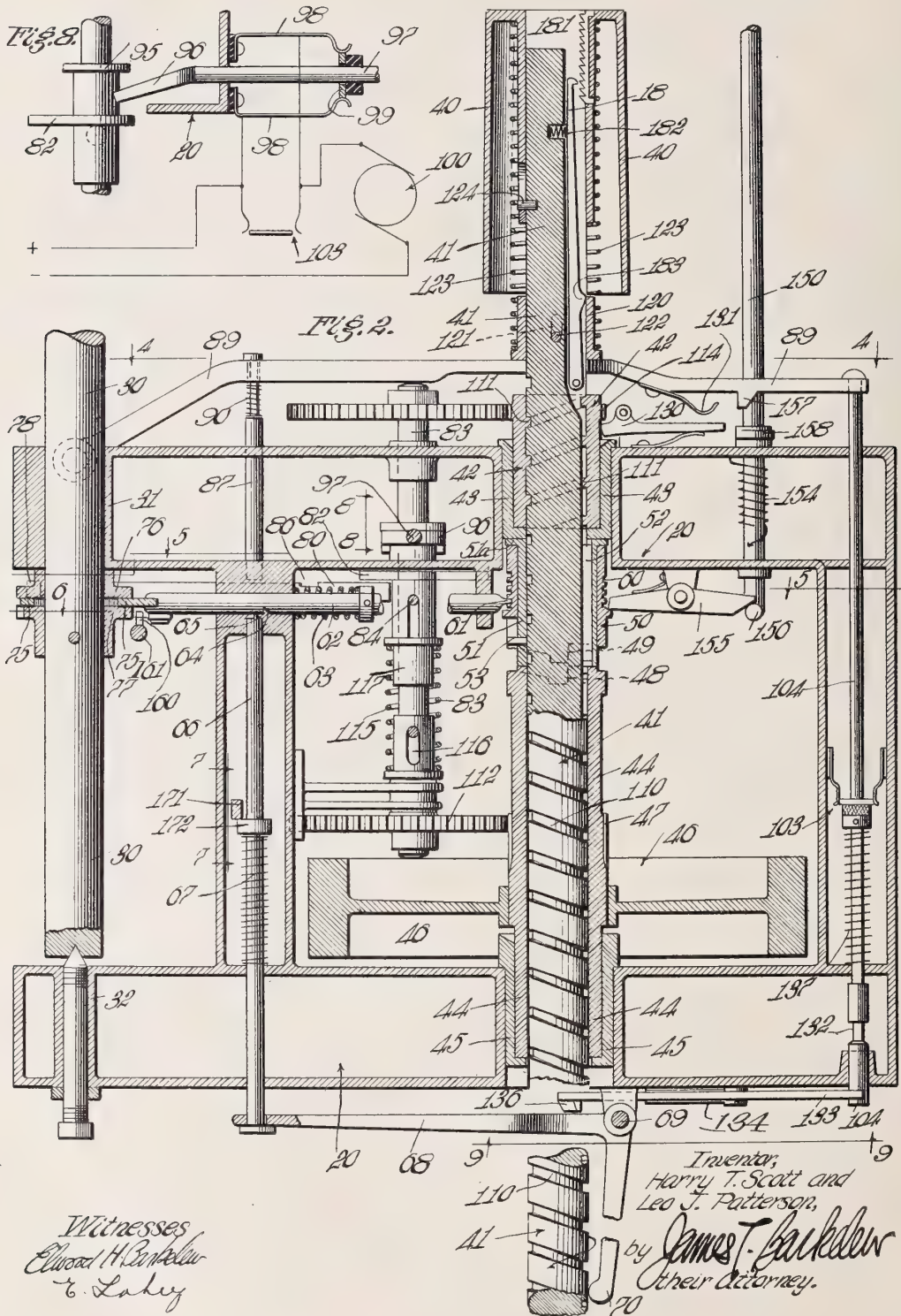


H. T. SCOTT & L. J. PATTERSON.  
 AUTOMATIC PHONOGRAPH.  
 APPLICATION FILED APR. 11, 1912.

1,040,034.

Patented Oct. 1, 1912.

3 SHEETS—SHEET 2.





H. T. SCOTT & L. J. PATTERSON.

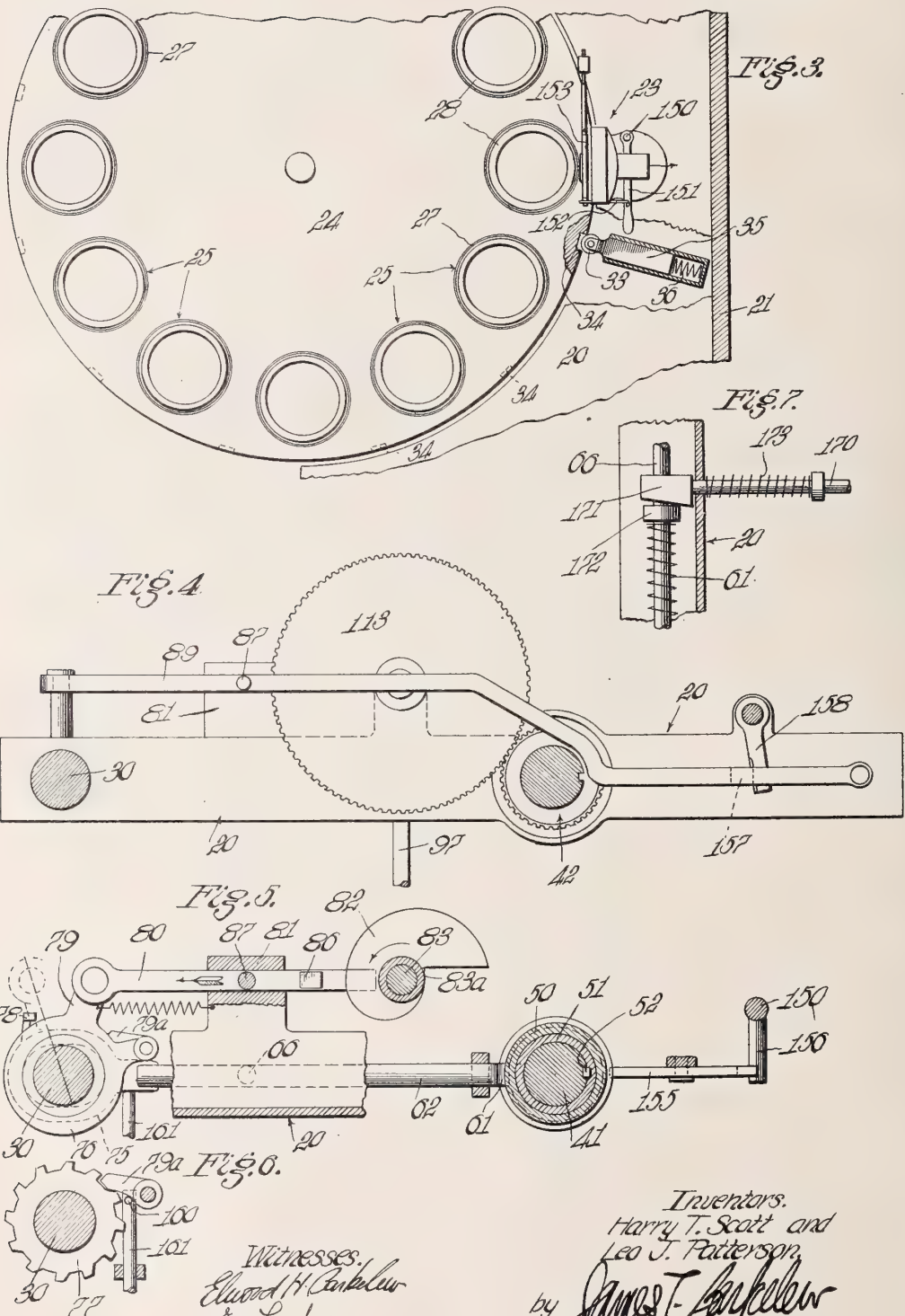
AUTOMATIC PHONOGRAPH.

APPLICATION FILED APR. 11, 1912.

1,040,034.

Patented Oct. 1, 1912.

3 SHEETS-SHEET 3.



Witnesses:  
Edward H. Conkleur  
& L. L. Lohy.

Inventors:  
Harry T. Scott and  
Leo J. Patterson,  
by James T. Conkleur  
their Attorney.



# UNITED STATES PATENT OFFICE.

HARRY T. SCOTT AND LEO J. PATTERSON, OF LOS ANGELES, CALIFORNIA; SAID PATTERSON ASSIGNOR TO SAID SCOTT.

## AUTOMATIC PHONOGRAPH.

1,040,034.

Specification of Letters Patent.

Patented Oct. 1, 1912.

Application filed April 11, 1912. Serial No. 690,116.

*To all whom it may concern:*

Be it known that we, HARRY T. SCOTT and LEO J. PATTERSON, citizens of the United States, both residing at Los Angeles, in the county of Los Angeles, State of California, have invented new and useful Improvements in Automatic Phonographs, of which the following is a specification.

This invention relates to an automatic phonograph for playing automatically and successively a number of phonograph records of the ordinary cylindrical, or Edison type and the invention consists primarily in an arrangement of mechanisms whereby the records are carried with their axes in vertical positions and are moved from the carrying member, magazine or table, to a position adjacent the reproducing mechanism, automatic means being employed for then so operating the record and the reproducing mechanism as to reproduce the sound from the record and to then return the record to the magazine or table.

In its specific preferred embodiment, our invention consists of a suitable movable record carrying magazine or table, preferably a horizontally rotating table mounted on a vertical axis, the table having pockets arranged around its periphery in which the cylindrical records are adapted to loosely rest. The records thus stand in their normal vertical positions without forcible contact with a mandrel or any other device; in fact, the records are as free from liability to deterioration and breakage as they are when packed in specially made cases. The records rest on annular shelves in the table pockets, the pockets extending with reduced diameter down through the table, so that there is an opening under each pocket through which the record raising member and record engaging mandrel may pass. The table is provided with an intermittent rotating mechanism so that it may be moved to place successive records over the record engaging mandrel; but it will be seen from the following specification that this table moving mechanism may be thrown out of action temporarily or completely, or that it may be moved by hand instead of by its automatic mechanism. The record engaging mandrel is mounted on the upper end of the vertically movable and rotatable shaft.

the action of the shaft being first to move vertically and engage the mandrel with the record immediately above, move the record to a point adjacent the reproducing mechanism, and then to rotate and slowly move downwardly in a manner designed to keep the sound groove of the record in engagement with the reproducing point or stylus. In other words, the record is both rotated and moved longitudinally—given two distinct movements—instead of as heretofore rotating the record and moving the reproducing mechanism longitudinally along the record. In our machine the reproducing mechanism is held stationary, at least so far as movement along the record is concerned. When the record carrying mandrel is moved downwardly to a point where the reproduction of a record is completed, the mechanism allows the mandrel to move quickly to its lowermost position. In addition to this the record is left in its pocket on the table and immediately the mandrel has reached its lowermost position and is free of the table, the table is rotated through a certain portion of a revolution to bring the next record directly over the mandrel. When this has been accomplished the mandrel is again started upward and the whole operation is repeated. We have provided certain devices for the manual control of this mechanism, allowing the records to be played in any desired manner. If desired, the table operating mechanism may be thrown out of action and the table or other record support moved by hand. The records need not then be played in succession as placed upon the table, any desired record being played directly after any other; or the same record may be repeated indefinitely. Manually controlled means are also provided for discontinuing the playing of any record, immediately replacing it upon the record support or table and passing to the next record. These two manually operable devices provide for complete control over the machine. If the magazine or table of the machine will contain a dozen records, the operator may select the dozen or less records he wishes to hear, place them in the machine and pull out the starting button. The machine is preferably operated electrically; and operation of the starting button closes



the electric circuit to the operating motor. The mechanism immediately starts operation, engaging and reproducing the first record, passing immediately to the next one and so on until it has played the entire number selected. Should the operator then desire, the machine will keep on indefinitely repeating the records in succession. When it is desired to stop the machine, the starting and stopping button is pressed; but the machine will not stop until it has disposed of the record then being played. It will either complete the reproduction of that particular record and replace it upon the record table, or the record discontinuing button may be pressed and the operation stopped immediately. But, in whichever way the operation is stopped, the machine will always come to a certain definite position before coming to rest; and in this position it is impossible for any manual operation of the exposed parts of the machine to cause it damage.

One of the prime features of our invention is its extreme simplicity. We are enabled to accomplish the above described operations with an amount of mechanism very little in excess of the machinery sometimes used to reproduce but a single record. There are many different manners of moving the several parts of our machine; but we have adopted what appears to be the most simple mode of operation and will hereinafter describe the mechanism which we conceive to be the simplest and the one which accomplishes its results in the most satisfactory and direct manner. In this preferred form of mechanism a rotatable nut engages with a thread on the mandrel shaft, so that, by rotation of this nut, the shaft may be either raised or lowered, according to the direction of rotation. Means are provided for rotating the nut and the shaft at differential speeds, and for starting and stopping rotation of the nut and shaft at different points in the operation of the machine. The direction of the mandrel screw thread in the present machine is such that, to feed the mandrel shaft downwardly by the differential action, the nut must be rotated slightly faster than the shaft itself; but this may be arranged as desired. For driving the nut a simple gear mechanism is provided connecting the nut with a sleeve rotating about the nut. This sleeve is loosely mounted on the shaft and is suitably rotatably connectible thereto. The gears connect the sleeve with the nut in such manner that the nut travels slightly faster than the sleeve and in the same direction; and the mechanism for starting and stopping the rotation of the nut takes the form of means for simply shifting these gears to throw them into and out of engagement.

The nut and shaft preferably rotate in the

same direction; so that it will be seen that, if the arrangement is such that when the nut alone is revolving the shaft is moved downwardly, when the shaft alone revolves in the same direction it will be moved upwardly. The rate of these movements will depend entirely upon the speed of rotation of the nut and shaft and the pitch of the screw thread; and the pitch is made sufficiently coarse to cause the movement of the shaft at considerable velocity when either the nut or the shaft is rotated alone. But when the nut and shaft are rotated together, the differential action causes the slow downward movement of the shaft while it is rotated; and it is during this movement that the reproducing mechanism is thrown into engagement with the record to follow its sound groove. Thus, considered in a broad manner, the operation of the device is as follows: Mechanism controlled by the shaft when in its lowermost position causes the shaft to begin rotating. This immediately screws the shaft upwardly until it reaches its uppermost point. Mechanism controlled by the position of the shaft at its uppermost point causes the nut to begin revolving and the shaft is then moved down differentially while it is rotated. When the shaft has moved downwardly through a portion of its downward motion and the record on the mandrel has completely passed by the reproducing mechanism, mechanism is engaged by the shaft to stop the rotation of the shaft, the nut alone continuing its rotation. This causes the quick downward motion of the shaft to its original position. We have shown this preferred form of mechanism in the accompanying drawings, in which:

Figure 1 is a front elevation with parts in vertical longitudinal section. Fig. 2 is a vertical longitudinal section of the main operating portions of our machine. Fig. 3 is a partial plan showing the record carrying table and the reproducer mechanism. Fig. 4 is a detail horizontal section taken on line 4—4 of Fig. 2. Fig. 5 is a detail horizontal section taken on line 5—5 of Fig. 2. Fig. 6 is a detail horizontal section taken on line 6 of Fig. 2. Fig. 7 is a detail section taken as indicated by line 7—7 of Fig. 2. Fig. 8 is partially a detail section taken as indicated by line 8—8 of Fig. 2 and partially a diagrammatic view showing the electrical connections of the driving motor and the controlling switches. Fig. 9 is a bottom plan taken as indicated by line 9—9 of Fig. 2. Fig. 10 is a sectional detail showing the governor connection of the driving motor to the mechanism. Fig. 11 is a vertical section showing a modified arrangement of mandrel shaft and nut. Fig. 12 is a section taken on line 12—12 of Fig. 11.

In the drawings 20 designates a suitable

frame of any suitable material and preferably mounted in a case 21 of any desired design. This case has an upper shelf or floor 22 on which the reproducing mechanism 23 is mounted and of whose upper surface the revolving record table or support 24 forms practically a continuation. Record table 24 is provided with a plurality of pockets 25 arranged around its periphery, these pockets 25 extending vertically through the table 24. At the lower ends of the pockets annular shelves 26 are provided in any desired manner, and the upper surface of these shelves and the interior surface of the pockets are covered with a protective layer of felt or any other suitable material. Records 28 are placed in these pockets, standing loosely therein on annular shelves 26; and the openings 26<sup>a</sup> through the annular shelves are sufficiently large to pass a mandrel which will engage with the interior of the cylindrical records. It will be seen that the records are carried in a manner which precludes entirely their liability to deformation or to breakage by contraction and expansion. Cylindrical records are usually best stored in a vertical position; and our machine has the advantage of holding the records in this most desirable position while they are in our machine. And it will be seen that the records are only engaged on a mandrel while they are actually being reproduced; and this completely obviates breakage by contraction of records on the mandrel which occurs in machines where the records are left on the mandrels for a long period.

Record table 24 is mounted on a vertical shaft 30 supported in suitable bearings 31 and 32 in frame 20. Rotation of the record table about the axis of shaft 30 will bring any desired record 28 opposite the reproducing mechanism 23 and into playing position. We employ a registering device for accurately registering the table in these positions, this device consisting in a spring pressed roller 33 (see Figs. 1 and 3) adapted to enter any one of suitable notches 34 in the periphery of the table. The roller 33 is mounted on a suitable plunger 35 and is pressed toward the table by a spring 36. The engagement of the roller with any one of the notches is sufficient to hold the table securely in position, but insufficient to prevent the table from being moved from one position to the next. The mechanism for moving the table from one position to another will be hereinafter described.

Directly beneath the record pocket which stands opposite the reproducing mechanism 23 there normally stands a record engaging mandrel 40. Mandrel 40 is mounted and supported on mandrel shaft 41, this shaft being adapted for both longitudinal movement along and rotation about its vertical

axis. The shaft 41 is preferably not directly journaled in frame 20; but at its upper end it is journaled in a nut 42 which in turn is journaled in a suitable bearing 43 in frame 20, and at its lower end the shaft is journaled in a sleeve 44 which in turn is journaled in a suitable bearing 45 in frame 20. These arrangements are made for sake of simplicity of manufacture and operation. The sleeve 44 is of some vertical longitudinal extent and surrounds the shaft 41 with a running fit. Directly above bearing 45 drive balance wheel 46 is secured to the sleeve 44, being tightly forced on the sleeve in the position shown. Directly above the balance wheel 46 a gear 47 is cut on the sleeve; and at the upper end of sleeve 44 a clutch member 48 is formed adapted to engage with a corresponding clutch member 49 on the lower end of a sliding and revolving sleeve 50. Sleeve 50 surrounds and slides vertically on a sleeve 51 whose lower end engages the upper end of sleeve 44 and prevents sleeve 44 from rising and whose upper end engages the lower end of bearing 43, the sleeve 51 being thus prevented from longitudinal movement. Sleeve 51 is secured by key or spline 52 to rotate always with shaft 41, while sleeve 50 is secured by a pin and slot arrangement 53 to rotate always with sleeve 51 but to be vertically slidable thereon so as to engage and disengage clutch members 48 and 49; and when the clutch members are disengaged and the sleeve 50 is in its uppermost position, the upper end of sleeve 50 engages a flange 51<sup>a</sup> on sleeve 51 as a limit to its upward movement. By mounting sleeve 50 on sleeve 51 which has no vertical longitudinal movement, instead of mounting it directly on shaft 41 which has vertical longitudinal movement, it will be seen that all tendency of the vertically moving shaft to move sleeve 50 is avoided.

The sleeve 50 has a screw thread 60 with which the end 61 of a horizontally moving detent 62 is adapted to engage. Detent 62 is mounted in suitable bearings in the frame 20 and is provided with a spring 63 which normally continuously presses the detent toward and into the screw thread 60; but certain stop mechanisms are provided for holding the detent against such movement at certain times. A notch 64 is preferably cut in the under side of detent 62 and the correspondingly shaped upper end 65 of catch rod 66 is adapted to enter the notch when the detent 62 is moved to the left in Fig. 2. Catch rod 66 is normally pressed upwardly by a spring 67 and it may be pulled down and out of engagement with the detent 62 by the action of a bell crank lever 68 pivoted at 69 on the under side of frame 20, the end 70 of one arm of the lever being adapted for engagement by collar 71 on the lower end of mandrel shaft 41 when the mandrel shaft



has moved upwardly to a sufficient extent. Collar 71 has also another function to perform when the shaft 41 is at its uppermost point of movement; this will be later explained.

The detent 62 is connected at its end to a plate 75 confined between a collar 76 and ratchet 77 on table shaft 30. The aperture in plate 75 is sufficient to allow longitudinal movement of detent 62. The plate 75 is provided with a lug 78 which projects outside the periphery of collar 76 and upwardly so as to be engaged by arm 79 extending from collar 76 when the arm 79 has moved to the position indicated in dotted lines in Fig. 5; and the latter part of this movement of arm 79 moves the lug 78 so as to move the detent 62 sufficiently to disengage its end 61 from screw thread 60 of sleeve 50. The arm 79 is moved from the position shown in full lines to the position shown in dotted lines through the medium of a push rod 80 mounted in suitable bearings 81 in the frame and adapted to engage with a cam 82 mounted on differential shaft 83. The cam 82 is mounted on the differential shaft through the medium of a pin and slot arrangement 84 so that it will rotate with the shaft but not necessarily move down with the shaft from its position as shown in Fig. 2. The push rod 80 normally rests in the position shown in Figs. 2 and 5, with its cam engaging end below the cam 82; and it is necessary for the cam to be lowered in order to engage this push rod and to force it to the left in Fig. 5 by virtue of rotation of the cam. The push rod 80 has a notch 86 engageable by a vertically moving catch rod 87 which is hung loosely from lever 89. When lever 89 is moved down from its position shown in Fig. 2, it will press against spring 90 and thus force the catch rod 87 into the notch 86 when the notch 86 is moved below the end of the catch rod; the sequence of operations being such that the catch rod 87 is pushed down before the push rod 80 is moved from its position shown in Fig. 2. The cam 82, as hereinbefore stated, is mounted on differential shaft 83 so as to rotate therewith but not necessarily to move longitudinally therewith. Connected with the cam is a sleeve having a collar 95 on its upper end engageable by an inclined yoke 96 so as to raise the sleeve and the cam 82 to the position shown in Fig. 2 or so as to hold it in that position and not allow it to drop when the differential shaft 83 is pushed downwardly. This yoke 96 is mounted on the end of a push rod 97 manually operable from the front of the machine. Two switch contacts 98 are so mounted on frame 20 that electrical circuit is adapted to be closed between them by a disk 99 carried on push rod 97 when the push rod is in the position shown in Fig. 8 and when inclined yoke 96

is out of engagement with collar 95. When the rod 97 is pushed in to break the circuit between contacts 98 and to stop the machine, then the yoke 96 is placed beneath the collar 95 to hold the cam 82 in the position shown and to prevent it dropping into engagement with rod 80. Thus, whenever the machine is stopped, the automatic operation of the table does not take place until the machine is again started. This will be explained hereinafter.

We have shown a motor 100 for driving the machine, this motor being connected to fly wheel 46 through the medium of a friction wheel 101 controlled by a suitable ball governor 102. The speed of the machine is thus kept uniform. Motor 100 is illustrated diagrammatically in Fig. 8 and the connections to any suitable source of electrical energy are also illustrated. It will be noted that closure of circuit through the contacts 98 will supply current to the motor; and also that closure of circuit through a switch 103 will supply current thereto. This switch 103 is mounted on a rod 104 depending from the outer end of lever 89. When the lever 89 is below the position shown, the circuit through switch 103 will be broken; but, as the lever is only in its lowermost position when the mandrel shaft 41 is in its lowermost position, the switch 103 is only open when the shaft is in its lowermost position and when mandrel 40 is sufficiently low to entirely disengage the table 24. Thus, if push rod 97 is moved inwardly while the mandrel is in one of its upper positions, the machine will continue operation until the switch 103 is opened by the shaft reaching its lowermost position.

We will now explain the preferred mechanism by means of which the shaft 41 is moved longitudinally and rotated in proper relation to its longitudinal movement, and will then explain the complete operation of the combined mechanism.

Shaft 41 is provided with a suitable screw thread 110 in such direction which, engaging with the corresponding threads 111 on the interior of nut 42, will raise the shaft when rotated in the direction indicated by the arrow in the lower portion of Figs. 1 and 2. Nut 42 is also rotatable; and the fundamental feature of this preferred form of mechanism consists in providing certain means for intermittently rotating the shaft and the nut, preferably in the same direction. The nut is started and stopped in rotation at certain points of the operation and likewise the shaft; and the relative speeds of rotation of the shaft and nut are such as to accomplish the movements required of the machine. With the nut rotating in the same direction as the mandrel shaft, to feed the mandrel shaft down-



wardly by differential action the nut must be rotated faster than the shaft; but it will be seen that, by suitable arrangements, this differential action might be exactly reversed. A simple gear mechanism is employed for driving the nut, consisting of a gear 112 mounted on the lower end of differential shaft 83 and meshing with gear 47 on sleeve 44, and gear 113 mounted on the upper end of differential shaft 83 and meshing intermittently with gear 114 on the exterior of nut 42. In the present arrangement gear 113 has more teeth than gear 112, the ratio being such that the nut 42 is rotated  $\frac{1}{100}$  times faster than sleeve 44 and shaft 41. This difference in number of teeth of the two gears is so slight as to not require an appreciable difference in diameter of the gears; so that we have found in practice that it is possible to arrange the two gears 112 and 113 on the same shaft, either setting the shaft over slightly at its upper end or cutting the teeth in gear 113 slightly closer together. Any suitable arrangement, however, may be used to accommodate these two gears. The pitch of screw thread 110 is preferably a half inch; so that it will be seen that, when the nut and shaft are both rotating in the same direction, the shaft will be fed downwardly  $\frac{1}{200}$  of an inch for each of its own revolutions. Differential shaft 83 is slidable and is held in its upper position, as shown by means of a spring 115. Spring 115 is confined between two sleeves 116 and 117 slidable on shaft 83, the lower sleeve being revolvably secured to the shaft, so that both sleeves and the spring will rotate therewith. This places the spring between two parts which have the same motion and thus eliminates all friction and torsion on the spring. The upper end of shaft 83 comes directly beneath a portion of lever 89 so that it may be pushed down when the lever 89 is pushed down. Lever 89 is moved downwardly by engagement with a collar 120 mounted on mandrel shaft 41 directly beneath mandrel 40. This collar 120 is not rigidly mounted on the mandrel shaft but is provided with a slot 121 engaging a pin 122 to allow a limited vertical movement. Normally, the collar 120 is pressed downwardly by a spring 123 which seats thereon. This spring 123 extends upwardly and supports the hollow mandrel 40 in the position shown, a suitable stop 124 being provided to limit the upward movement of the mandrel. The operation of this mandrel will be hereinafter described; it will here suffice to say that the collar 120 first engaging with lever 89 is pressed upwardly to the position illustrated and then, by further downward movement of the shaft 41, the lever 89 is pressed down and forces the shaft 83 downwardly until gear 113 is out of engagement with gear 114. This

stops the rotation of nut 42; and at the same time a small brake 130 is applied to the surface of the nut to keep it from being rotated by frictional engagement with the still rotating shaft 41. Brake 130 is preferably a simple pivoted arm engageable by a suitable spring 131 mounted on lever 89. When the shaft 41 has reached its lowermost point, then rod 104 has moved downwardly until an annular notch 132 at its lower end can be engaged by a catch 133. The lower side of this notch 132 is beveled, as illustrated in Fig. 2, so that when the catch 133 enters its action may be to pull the rod 104 farther down. A spring 134 presses the catch 133 into engagement with the rod 104, the catch being pivoted at 135 on the bottom of frame 20. The catch 133 is in the form of a double armed lever, and its arm opposite that which engages the rod 104 is provided with a lug 136 adapted to be engaged by collar 71 on the lower end of mandrel shaft 41. The action of this collar on the catch 133 is to move the catch in the direction indicated by the arrow in Fig. 9 so as to release it from the notch 132 and allow the rod 104 to be moved to its normal upper position by spring 137 and allow lever 89 to be raised by shaft 83 tending to rise under the action of spring 115.

In describing the operation, we will start with the machine in the position shown. Fly wheel 46 is being rotated in the direction indicated by the arrow, and with it the sleeve 44. Shaft 41 is not now being rotated, the clutch members 48 and 49 being held out of engagement by the mechanism hereinbefore described. (It will be remembered that the only rotary connection between sleeve 44 and shaft 41 is through the clutch members 48 and 49 and the sleeves 50 and 51.) Nut 42 is being rotated in the same direction as fly wheel 46 and is therefore moving shaft 41 downwardly at considerable velocity. This downward movement of the shaft immediately causes the downward movement of lever 89, causing the disengagement of gear 113 from gear 114 and causing the application of brake 130 to the nut to stop its rotation. Simultaneously with this action, the catch 133 engages the notch 132 to hold the lever 89 in its lower position until the catch 133 is released. The shaft 83 being thus held in its lower position, it is still rotated by the engagement of gear 112 with gear 47 on sleeve 44, and the cam 82 will drop down to engage its face with push rod 80 as soon as its lower point 83<sup>a</sup> comes opposite the push rod 86. Immediately this has occurred, the push rod is moved in the direction indicated and thus moves the arm 79 and the collar 76 through approximately a twelfth of a revolution. A pawl 79<sup>a</sup> moves with the collar 76 and engages the teeth of ratchet 77 so as to



move the ratchet and the table shaft 30 through a twelfth of a revolution. The table is thus moved from one position to the next, being registered in correct position by the registry device hereinbefore described.

The catch rod 87 drops into notch 86 and holds the push rod 80 in its position to the left in Fig. 5 and thus prevents another feeding movement taking place while the differential shaft 83 and the cam 82 are in their lowermost positions. During the last portion of the movement of arm 79 it engages the lug 78 to move the lug and to thereby move the detent 62 as hereinbefore described. When the detent 62 is moved its end 61 is moved out of engagement with the screw thread 60 on sleeve 50 and the end 65 of catch rod 66 is allowed to enter notch 64 in the detent to hold it in its left hand position in Fig. 2. The sleeve 50 immediately drops and the clutch members 48 and 49 engage each other and immediately start the rotation of shaft 41. Nut 42 is still held stationary, and the rotation of shaft 41 will thus move the shaft upwardly at a considerable velocity. In its upward movement, the mandrel 40 engages a record 28 and moves it upwardly until its lowermost sound groove is directly opposite or slightly above the stylus point 23<sup>a</sup> of reproducing mechanism 23. As collar 71 on the lower end of shaft 41 passes the lower end 70 of bell crank lever 68, it will press the lever 68 outwardly and pull the catch rod 66 downwardly. But the detent 62 is still held in its left hand position by the engagement of lug 78 with arm 79, the arm 79 being held in its left hand position in Fig. 5 as hereinbefore explained by the engagement of rod 87 with notch 86 in push rod 80. The catch rod 66 will therefore be allowed to drop immediately again into notch 64 and to hold the detent 62 in its left hand position until released. When the shaft and mandrel reach their uppermost positions, the collar 71 engages the portion 136 of catch 133 and moves it to release the rod 104. This immediately allows the lever 89 to move upwardly, releasing brake 130 from nut 42 and engaging gear 113 with gear 114 and starting the rotation of the nut. The shaft and nut are now both rotating in the same direction and the downward differential movement of the shaft begins. The reproducer mechanism has been let into engagement with the record by a suitable mechanism and reproduction immediately starts. When the shaft 41 has been fed downwardly by this differential movement through the length of a record, or of the sound grooves thereon, the collar 71 on the end of shaft 41 will engage again with end portion 70 of bell crank lever 68 and will pull the catch rod 66 from engagement with the notch 64 in detent 62. The push rod 80 being no

longer held by the rod 87, the detent 62 is allowed to move to the right under the influence of its spring 63 and its end 61 will immediately engage with the screw thread 60 of sleeve 50. Further rotation of the sleeve 50 will cause it to be raised until the clutch members 48 and 49 have disengaged. This immediately stops the rotation of shaft 41; but nut 42 is still rotating. The shaft is thus fed quickly downwardly until it reaches the position shown in Figs. 1 and 2, the record 28 being meanwhile replaced upon the table. The whole operation is then repeated as just described.

The reproducer mechanism is operated through the medium of a suitable reproducer shaft 150 which projects upwardly through the shelf 22 of the case and has an arm 151 engaging with a link 152 and thus adapted to pull the stylus plate 153 of the reproducer back to disengage stylus 23<sup>a</sup> from a record. There are spring means in the reproducer mechanism (not shown) for throwing the stylus into engagement with a record when released. The reproducer shaft 150 tends to rotation in the direction indicated in Fig. 2 under the influence of a spring 154; but means are employed to hold the reproducer shaft in the position shown while the sleeve 50 is in its uppermost position or while the lever 89 is in its lowermost position. When the sleeve 50 moves upwardly it moves a small lever 155 having a beveled end engaging a radially projecting arm 156 on shaft 150. The shaft is thus moved to the position shown. When lever 89 moves downwardly a lug 157 thereon engages an arm 158 mounted on shaft 150 and thus holds the shaft 150 in the position illustrated until the lever 89 shall move upwardly. Thus it will be seen that the reproducer point is moved from engagement with a record when the sleeve 50 is raised; and it will be remembered that this sleeve 50 rises when the reproduction of a record has been completed. And the reproducer point is only let into engagement with the record when the lever 89 moves upwardly, or when the mandrel 40 has picked up another record and has reached its uppermost position with it.

We will now explain the means for manually controlling the operation of the machine.

For causing the repetition of a single record, it is only necessary to cause the table 24 not to move from one position to the next. This is simply accomplished by means of a pin 160 adapted to engage pawl 79<sup>a</sup> and mounted on the end of a push rod 161. This rod 161 may be manually operated; and its friction is usually sufficient to hold it in position with the pawl 79<sup>a</sup> raised so that it will move over the tooth of ratchet 77 which it would otherwise engage to move the

ratchet through a twelfth of a revolution. If rod 161 is thus pushed inwardly and left in that position it will cause the continuous reproduction of any desired record. When  
 5 it is desired to go on to successive records the rod 161 is pulled outwardly. If it is desired to discontinue a record which is being played and to immediately replace it upon the table and to go on to the next record, it is  
 10 only necessary to press inwardly upon a rod 170. This rod has upon its inner end a small wedge 171 engaging over collar 172 on catch rod 66. Inward movement of rod 170 will thus move catch rod 66 down, allowing  
 15 detent 62 to move to the right in Fig. 2 to engage the screw thread 60 of sleeve 50 and thus to raise the sleeve 50 and stop the rotation of shaft 41. Whenever the shaft 41 is stopped in rotation it is immediately fed  
 20 downwardly by rotation of nut 42, the record upon mandrel 40 replaced upon the table, and the table moved to present a new record. The rod 170 is normally held outwardly by means of a spring 173, so that it  
 25 will immediately return to its normal position after each operation.

The action of mandrel 40 on mandrel shaft 41 is such as to always accurately place the record on the mandrel into proper position with relation to the reproducing mechanism. Records vary somewhat in their internal diameters, and are also apt to become warped, and will therefore fit at different positions upon the mandrel 40. When the  
 30 mandrel 40 picks up a record the record settles loosely around its conical surface and the mandrel then moves on upwardly and the record will engage with suitable stationary members (not shown) situated at such a height that, when the upper edge of the record engages them, it will be in correct starting position before the reproducing mechanism. The mandrel shaft is arranged so that it will have a slightly excessive movement upward, and this excessive movement  
 45 is taken up by the shaft sliding upwardly through the mandrel. A pawl 180 will then engage with ratchet teeth 181 on the mandrel and will hold the mandrel down on the shaft when the shaft has moved to its uppermost position. This pawl 180 is pivoted to the mandrel shaft and is operated by a spring 182. It will thus be seen that the downward movement of a record will always start from  
 50 the proper position. When the mandrel reaches its lowermost position, the sleeve 120 is pressed upwardly by engagement with lever 89 as hereinbefore described and this upward movement causes the pawl 180 to be  
 55 pressed inwardly by reason of engagement of the sleeve with a projecting inclined portion 183 on the pawl. The mandrel will then immediately be moved to its uppermost position ready for taking the next record  
 60 and for being adjusted properly therefor.

In Figs. 11 and 12 we have shown modified forms of mounting the nut 42<sup>a</sup> and the shaft 41<sup>a</sup>. In this form the shaft is mounted directly in bearings of its own, as at 200, and the nut has no exterior bearing. Around  
 70 the nut there is a sleeve 201 which carries a gear 114<sup>a</sup>, the sleeve 201 being connected with the nut 42<sup>a</sup> through the medium of two keys or similar devices 202, the keys being preferably loose in the sleeve 201. This arrangement provides for eliminating all vibration of gears 113 and 114 being transmitted to the mandrel shaft, providing the mandrel with an upper bearing of its own independent of the nut bearing.  
 75

Having described our invention, we claim:

1. In a device of the character described, a shaft rotatable and longitudinally translatable, a screw thread on the shaft, a rotatable gear toothed nut engaging the screw  
 85 thread, a rotating gear toothed sleeve loosely mounted around the shaft, another sleeve keyed to the shaft to slide thereon, inter-engaging means on the sleeves to rotatively connect them, differential gear connection  
 90 between the first mentioned sleeve and the nut comprising a differential shaft parallel to said first named shaft, gears rigidly mounted on said shaft and engaging with the gear teeth of the nut and loose sleeve  
 95 respectively, and means controlled by the longitudinal position of said first mentioned shaft to move the differential shaft and attached gears longitudinally to disengage one of them from the gear teeth normally meshing therewith, and means controlled by the longitudinal position of said first mentioned shaft to move said second mentioned sleeve on said shaft relatively to the first mentioned sleeve.  
 100

2. In a device of the character described, a vertical mandrel shaft rotatable and longitudinally translatable, a screw thread on the shaft, a rotatable gear toothed nut engaging the screw thread, a rotating gear  
 110 toothed sleeve loosely mounted around the mandrel shaft, another sleeve keyed to the shaft to rotate therewith and slide thereon, inter-engaging means on the sleeves to rotatively connect them together, differential  
 115 gear connection between the first mentioned sleeve and the nut comprising a differential shaft parallel to the mandrel shaft, two gears rigidly affixed one at the upper and one at the lower end of the differential shaft, the upper gear normally engaging the gear teeth of the nut and the lower engaging the gear teeth of the sleeve, a spring normally holding the shaft and gears upwardly, means actuated by the downward  
 120 movement of the mandrel shaft to move the differential shaft and gears downwardly to disengage the upper differential gear from the gear teeth of the nut, and means controlled by the longitudinal position of the  
 125



mandrel shaft to move the second named sleeve on the mandrel shaft relative to the first mentioned sleeve.

3. In a device of the character described,  
 5 a vertical mandrel shaft rotatable and longitudinally translatable, a screw thread on the shaft, a rotatable gear toothed nut engaging the screw thread, a rotating gear toothed sleeve loosely mounted around the  
 10 mandrel shaft, another sleeve keyed to the shaft to rotate therewith and slide thereon, inter-engaging means on the sleeves to rotatively connect them together, differential gear connection between the first mentioned  
 15 sleeve and the nut comprising a differential shaft parallel to the mandrel shaft, two gears rigidly affixed one at the upper and one at the lower end of the differential shaft, the upper gear normally engaging  
 20 the gear teeth of the nut and the lower engaging the gear teeth of the sleeve, a spring normally holding the shaft and gears upwardly, means actuated by the downward movement of the mandrel shaft to move the  
 25 differential shaft and gears downwardly to disengage the upper differential gear from the gear teeth of the nut, means controlled by the longitudinal position of the mandrel shaft to move the second mentioned sleeve  
 30 on the mandrel shaft relative to the first mentioned sleeve, a vertical record supporting shaft, ratchet means for rotating said shaft, a cam mounted on and movable with the differential shaft, and a push rod engageable by the cam when the differential  
 35 shaft is moved downwardly, said push rod by its cam caused motion causing the operation of the said ratchet means.

40 4. In a device of the character described, a vertical mandrel shaft rotatable and longitudinally translatable, a screw thread on the shaft, a rotatable gear toothed nut engaging the screw thread, a rotating gear

toothed sleeve loosely mounted around the  
 mandrel shaft, another sleeve keyed to the  
 shaft to rotate therewith and slide thereon  
 45 inter-engaging means on the sleeves to rotatively connect them together, differential gear connection between the first mentioned sleeve and the nut comprising a differential  
 50 shaft parallel to the mandrel shaft, two gears rigidly affixed one at the upper and one at the lower end of the differential shaft, the upper gear normally engaging the gear teeth of the nut and the lower engaging the  
 55 gear teeth of the sleeve, a spring normally holding the shaft and gears upwardly, means actuated by the downward movement of the mandrel shaft to move the differential shaft and gears downwardly to dis-  
 60 engage the upper differential gear from the gear teeth of the nut, means controlled by the longitudinal position of the mandrel shaft to move the second mentioned sleeve on the mandrel shaft relative to the first  
 65 mentioned sleeve, a vertical record supporting shaft, ratchet means for rotating said shaft, a cam mounted on and movable with the differential shaft, a push rod engageable by the cam when the differential shaft is  
 70 moved downwardly, said push rod by its cam caused motion causing the operation of the said ratchet means, and means cooperating with said last named shaft controlled  
 75 means to hold said second mentioned sleeve away from the first mentioned sleeve releasable by the action of said ratchet means.

In witness that we claim the foregoing we have hereunto subscribed our names this 30th day of March, 1912.

HARRY T. SCOTT.  
 LEO J. PATTERSON.

Witnesses:

JAMES T. BARKELEW,  
 ELWOOD H. BARKELEW.



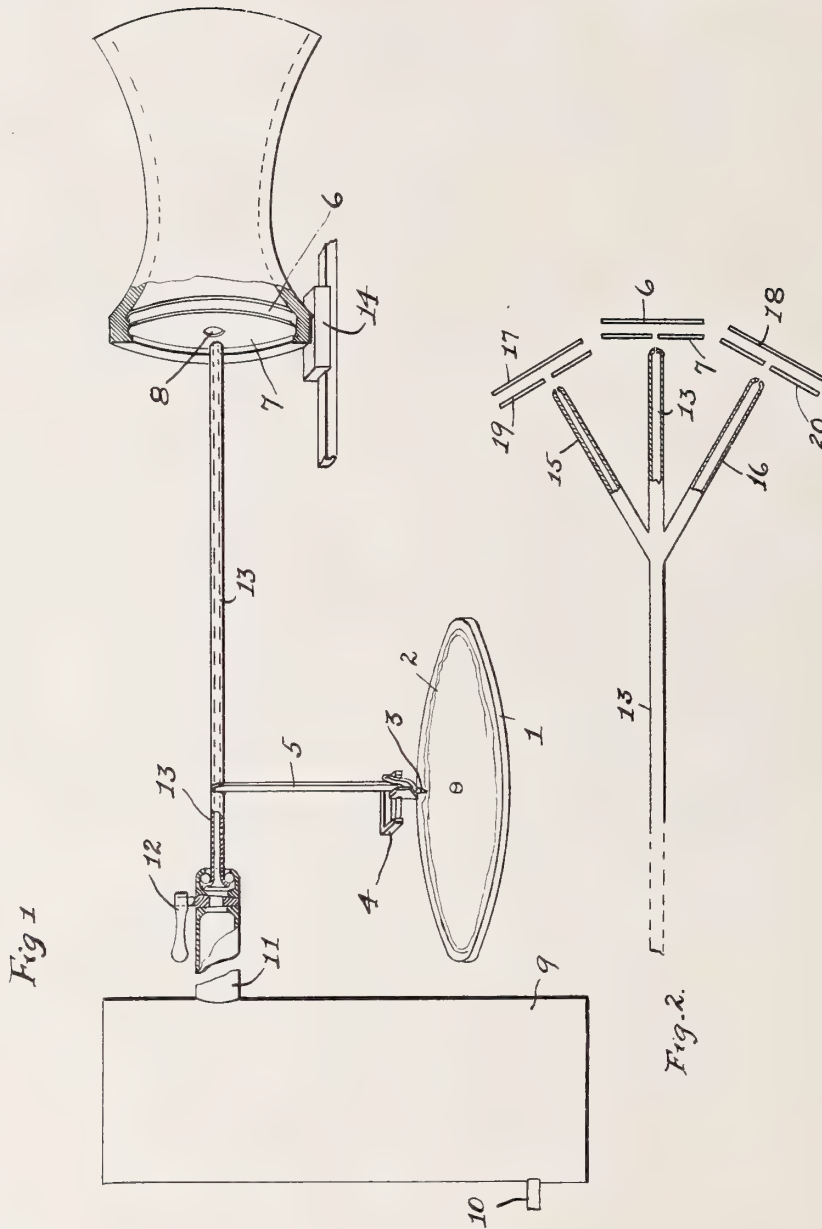


I. KITSEE.  
PHONOGRAPHY.

APPLICATION FILED JAN. 4, 1909.

1,040,213.

Patented Oct. 1, 1912.



WITNESSES

Edith R. Thiel  
Mary C. Smith

INVENTOR

*I. Kitsee*

# UNITED STATES PATENT OFFICE.

ISIDOR KITSEE, OF PHILADELPHIA, PENNSYLVANIA.

## PHONOGRAPHY.

1,040,213.

Specification of Letters Patent.

Patented Oct. 1, 1912.

Application filed January 4, 1909. Serial No. 470,636.

*To all whom it may concern:*

Be it known that I, ISIDOR KITSEE, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Phonography, of which the following is a specification.

My invention relates to an improvement in phonography.

It has reference to the reproduction of sound from sound-records.

It is immaterial for the purpose of my invention if the record is of the cylindrical or disk type; so also is the shape of the stylus or needle and its mode of support immaterial.

The necessary parts for practising my invention are a sound record (of any desired type), a needle or stylus, a source of gaseous material, a phonographic diaphragm, means to project a jet of said material on the diaphragm and means to deflect said jet in accordance with the variations of the lines of record.

In the accompanying drawing, I have illustrated one arrangement of practising this my invention, but it is obvious that the mechanical arrangement may differ to suit requirements without departing from the scope of my invention.

In the drawing, Figure 1 illustrates my invention in partial sectional and partial perspective view. Fig. 2 is a similar view of part of my invention in modified form.

1 is the sound record, here shown as one of the disk type; 2 the lines of record; 3 the stylus or needle; 4 the support for same; 5 the lever adapted to vibrate in unison with the vibrations of the stylus or needle; 6 the phonographic diaphragm; 7 a shield for same; 8 a perforation in said shield; 9 a reservoir for gaseous material; 10 the means to connect said reservoir to compressing means; 11 an outlet pipe; 12 a valve to control the outlet of the compressed gaseous material; 13 a hollow stylus or lever through which the gaseous material is to be conveyed. 14 are the means to move the diaphragm toward or away from the terminal of said stylus.

In Fig. 2, 15 and 16 are the branch levers extending from the lever 13. 17 and 18 are the diaphragms adjacent thereto and 19 and 20 are the shields of the diaphragm.

The mode of operation of my invention is

as follows: The stylus or needle 3 is placed in the grooves of the record 1 and the record is then, by any of the well known means, rotated or otherwise set in motion. The reservoir 9 is filled with compressed gaseous material, preferably with compressed air. The lever 5 is connected to the hollow stylus or lever 13. The diaphragm with its shield is placed in a position, so that the jet of air shall, during the vibration of the lever 13, alternately impinge on the diaphragm itself. The jet of air may normally strike the diaphragm, or may normally only strike the shield, and through the vibrations be brought right opposite the perforations 8 thereby striking the diaphragm. The valve 12 is open to a degree so that the force of the compressed air should be of the required strength when striking the diaphragm. Through the movement of the record 1, the needle 3 is vibrated and these vibrations are conveyed to the lever 5. The vibratory movement of this lever will set in vibrating motion the lever 13. The jet of air issuing from the mouth of this lever will then alternately strike, through the perforations 8, the diaphragm, or be impinged on the solid shield of the diaphragm. The diaphragm, therefore, will vibrate in accordance with the vibrations of the needle 3 and will, therefore, reproduce sound with the aid of which these vibratory lines of record were formerly produced. In Fig. 2, I have shown the means whereby with the same record 3, diaphragms may be set in vibratory motion, but it is obvious that the number of branch levers and, therefore, diaphragms may be increased at will. Through the greater or lesser opening of the valve 12, the force with which the air-jet strikes the diaphragm 6 may be regulated and varied even during the performance of the phonograph.

I have not illustrated the means by which the reservoir 9 may be filled with compressed air, as such means are well known and may differ according to requirements; but I prefer that during the time of the operation of the device, the reservoir 9 should remain connected through the means 10 with said compressing means.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. The method of reproducing sound, which consists in impinging a jet of a medium under pressure against a phonographic

diaphragm a limited area only of which is exposed to the action of said jet, and causing said jet to vibrate across the exposed area of said diaphragm under the influence of the vibratory lines of a sound record, whereby impingement of the medium upon the diaphragm takes place at intervals to cause said diaphragm to vibrate in harmony with the vibratory lines of the record.

2. The method of reproducing sound, which consists in causing a continuously-flowing gaseous jet to be deflected in accordance with the vibratory lines of a sound record, and receiving the jet upon the surface of a phonographic diaphragm a limited area only of which is exposed to the action of said jet, the range of deflection of said jet being greater than the exposed area of the diaphragm, whereby actual impingement is established only when the jet is moving across said exposed area in following the lines of the sound record.

3. The method of reproducing sound, which consists in exposing a limited area of a phonographic diaphragm, discharging a jet of a medium under pressure in the direction of the diaphragm for impingement

thereagainst, and deflecting said jet in accordance with the vibratory lines of a sound record and in relation to the exposed area of said diaphragm, whereby impingement upon the diaphragm takes place at intervals to cause said diaphragm to vibrate in harmony with the vibratory lines of the record.

4. The method of reproducing sound, which consists in impinging a jet of a medium under pressure against a phonographic diaphragm a limited area only of which is exposed to the action of said jet, causing said jet to vibrate across the exposed area of the diaphragm under the influence of the vibratory lines of a sound record, whereby impingement of the medium upon the diaphragm takes place at intervals to cause said diaphragm to vibrate in harmony with the vibratory lines of the record, and varying the force of said jet to vary the amplitude of the reproduced sound.

In testimony whereof I affix my signature in presence of two witnesses.

ISIDOR KITSEE.

Witnesses:

MARY C. SMITH,

EDITH R. STILLEY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."





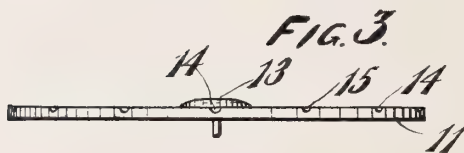
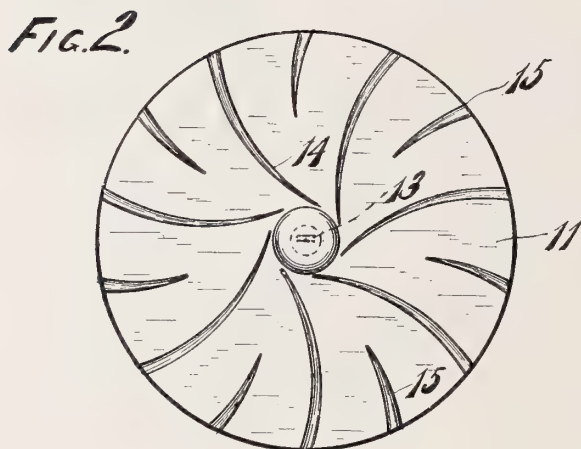
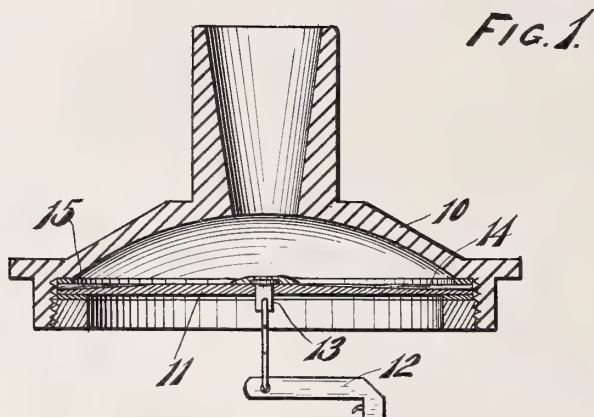
J. H. ELLIS & A. J. HOFFMAN.

DIAPHRAGM.

APPLICATION FILED OCT. 11, 1911.

1,040,294.

Patented Oct. 8, 1912.



WITNESSES

*L. D. Thurner*

*Katherine Holt*

INVENTORS

*James H. Ellis & Albert J. Hoffman*

*By Morsell & Caldwell*

ATTORNEYS.

# UNITED STATES PATENT OFFICE.

JAMES H. ELLIS, OF MILWAUKEE, AND ALBERT J. HOFFMAN, OF WAUWATOSA,  
WISCONSIN.

## DIAPHRAGM.

1,040,294.

Specification of Letters Patent.

Patented Oct. 8, 1912.

Application filed October 11, 1911. Serial No. 654,113.

*To all whom it may concern:*

Be it known that we, JAMES H. ELLIS, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, and ALBERT J. HOFFMAN, a citizen of the United States, and resident of Wauwatosa, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Diaphragms, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

This invention relates to diaphragm constructions for sound recording and reproducing instruments and has for its object to provide a diaphragm which while being highly sensitive to weak sound vibrations will properly respond to the stronger sound vibrations and will also truly record or reproduce the original volume of sound.

Another object of the invention is to provide a diaphragm construction of a single sheet of resilient material rendered more flexible at its peripheral or marginal portion by lines of scoring.

With the above and other objects in view, the invention consists in the diaphragm as herein claimed and all equivalents.

Referring to the accompanying drawings in which like characters of reference indicate the same parts in different views: Figure 1 is a sectional view of a diaphragm constructed in accordance with this invention in its position for use in a sound box; Fig. 2 is a plan view thereof; and Fig. 3 is an edge view thereof.

In these drawings 10 indicates a sound box of ordinary construction and 11 is the diaphragm embodying this invention, 12 being the usual stylus connected at the center thereof by connection 13. Under this invention the diaphragm is composed of a single sheet of resilient material, preferably celluloid in a disk shape which is clamped in the sound box at its edges, as usual. This disk is of a greater thickness than would be suitable for use in its unaltered condition, being too stiff to respond properly to slight vibrations, but it is so altered by means of scoring in one or the other surfaces thereof, as to render it more flexible at its peripheral or marginal portions just inside of the edge clamped by the sound box. The scoring for this purpose

may take any desired form but it has been found in practice to be desirable to cut or engrave arc shaped lines 14 having the general direction of radial lines but tangent to an imaginary circle concentric with the disk and terminating, or rather beginning at such point of tangency and becoming wider and deeper as they approach the edge of the disk. It has also been found desirable to form these arc shaped engraved or scored lines of approximately the same radius as the disk. It has further been found desirable to provide a disk with shorter supplemental scoring lines 15 similar to the lines 14 and positioned midway between them, but of only half the length thereof and confined to the outer edge of the disk. The direction of the scoring lines is such that the distorted sectors between them have the appearance of being twisted and are of greater length than if described by truly radial lines. Their greater length gives a greater resiliency to the diaphragm as a whole, but because of the scoring lines becoming deeper and wider as they approach the edge of the disk the degree of flexibility becomes greater as the edge or margin of the disk is approached. This is further assured by the presence at the marginal portion of the disk of the supplemental scoring lines 15.

With a diaphragm of this construction it has been found that the dense unresponsive disk which is unsuitable for diaphragm purposes before the scoring operation is performed on it is rendered freely sensitive to the weakest sound vibrations while accurately following the stronger vibrations and thus more truly recording and reproducing the sound value, whatever its volume may be. The scoring has the effect of weakening the margin of the diaphragm so that the diaphragm may respond bodily to all vibrations, whether weak or strong, and avoid the formation of local vibrations in the diaphragm which would disturb a truthful reproduction.

What we claim as new and desire to secure by Letters Patent, is:

1. A diaphragm having grooved arc shaped lines of varying depth therein arranged approximately radial.

2. A diaphragm, comprising a disk having grooved arc shaped lines of varying depth formed therein approximately radial

and tangent to a circle concentric with the disk.

3. A diaphragm, comprising a disk having arc shaped lines formed therein approximately radial and increasing in depth and width toward the edge of the disk.

4. A diaphragm, comprising a disk having grooved arc shaped lines of varying depth formed therein approximately radial, and supplemental arc shaped grooved lines

of varying depth intermediate of the radial lines at the margin of the disk.

In testimony whereof, we affix our signatures, in presence of two witnesses.

JAMES H. ELLIS.

ALBERT J. HOFFMAN.

Witnesses:

C. H. KEENEY,

R. S. C. CALDWELL.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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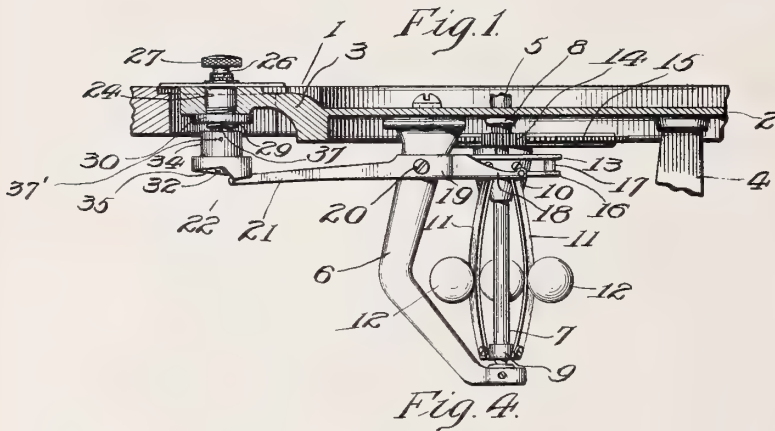
W. N. DENNISON.

SPEED REGULATOR FOR SOUND RECORDING AND REPRODUCING MACHINES.

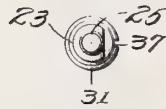
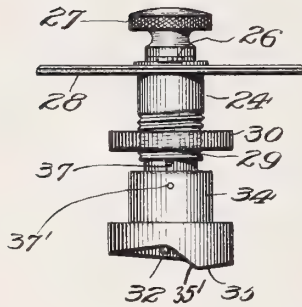
APPLICATION FILED FEB. 1, 1907.

1,040,522.

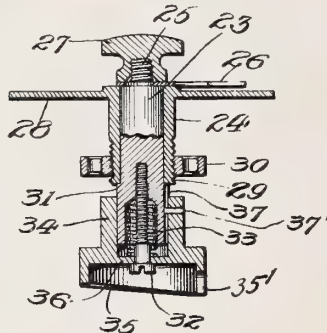
Patented Oct. 8, 1912.



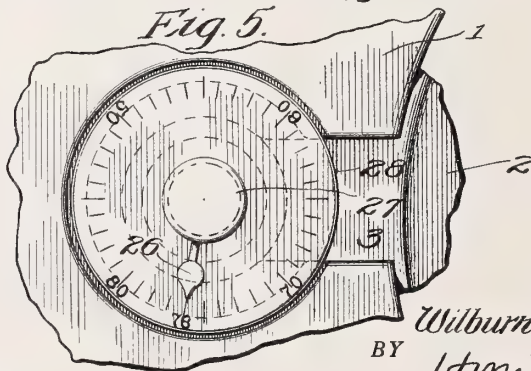
*Fig. 2.*



*Fig. 3.*



*Fig. 5.*



WITNESSES:

*A. J. Hartman.*  
*Alexander B. Moulton.*

INVENTOR

*Wilburn N. Dennison.*

BY

*Home Tel. Co.*  
ATTORNEY.

# UNITED STATES PATENT OFFICE.

WILBURN N. DENNISON, OF MERCHANTVILLE, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

SPEED-REGULATOR FOR SOUND RECORDING AND REPRODUCING MACHINES.

1,040,522.

Specification of Letters Patent.

Patented Oct. 8, 1912.

Application filed February 1, 1907. Serial No. 355,218.

*To all whom it may concern:*

Be it known that I, WILBURN N. DENNISON, a citizen of the United States, and a resident of the borough of Merchantville, county of Camden, and State of New Jersey, have invented certain new and useful Improvements in Speed-Regulators for Sound Recording and Reproducing Machines, of which the following is a full, complete, and exact disclosure.

The objects of this invention are, to provide an improved governor; to provide an improved governor by which the speed of a motor may be regulated to any pre-determined rate within prescribed limits by simply moving an index or finger over a numbered plate to a number corresponding to the speed desired; to provide improved means for adjusting a governor; to provide a governor having exposed means for varying the speed thereof and concealed means for adjusting the speed varying means, whereby tampering with or accidental displacement of the adjusting means will be avoided; to provide in a talking machine or other machine a rigid support, and a motor, a governor, and adjusting means for the governor, each secured rigidly to said support to hold said parts rigidly in predetermined positions of adjustment; and to provide other improvements as will appear hereinafter.

In the accompanying drawings, Figure 1 is a side elevation of a governor or speed regulator constructed in accordance with this invention and applied to a talking machine; Fig. 2 a side elevation of a portion of the same; Fig. 3 a vertical central section of Fig. 2; Fig. 4 a top plan view of a portion of Fig. 3 with attached parts removed; and Fig. 5 a fragmentary top plan view of a portion of the device.

Referring to the drawings, one embodiment of this invention comprises a talking machine having a casing 1 of wood or other suitable material, the top or cover of which is provided with an aperture in which is secured a flanged metal plate 2, having a lateral extension 3, and adapted to support the usual turntable and its actuating and speed controlling mechanism. The motor or actuating mechanism of the machine may be of any well known or suitable construction, and is located as usual within the casing 1, being supported by an arm 4 or other

suitable means depending from the plate 2. The turntable or record support is mounted as usual above the casing upon the upper end of a vertical spindle 5 which is journaled in the plate 1, and extends downwardly into the casing and is operatively connected to the motor of the machine to be rotated thereby. The turntable and the motor are not shown as these parts may be of any well known construction.

For controlling the speed of the machine, any well known or suitable governor may be used. In the construction illustrated, a friction governor of the well known fly ball type is used, and comprises an arm 6 which depends from the plate 2, and the lower end of which supports the lower end of a vertically arranged governor shaft 7, the upper end of which is journaled in a bearing 8, upon the under side of the plate 2.

Upon the lower end of the governor shaft 7 is fixed a collar 9, and slidably mounted upon the upper end of the governor shaft is a collar 10. These two collars are connected by means of spring members 11, each carrying a governor ball 12, and upon the upper face of the movable collar 10, is fixed a friction or brake disk 13. The governor shaft 7 is driven by a pinion 14 fixed upon the upper end thereof and engaging with a gear 15 mounted upon the turntable shaft 5, which is driven by the motor of the machine.

Below the friction disk 13 and spaced in close proximity thereto is a ring 16 carrying brake shoes or pads 17. This ring is pivotally supported between the outer ends of arms 18 of a yoke forming the inner end of a brake lever 19, the said lever 19 being fulcrumed to the side of the arm 6 by means of a screw or pivot 20. The outer end 21 of the brake lever is provided with an off-set 22 arranged to form a follower to be actuated as will be explained hereinafter, to control the speed of the governor.

For adjusting or controlling the speed of the governor, an index shaft 23, is rotatably mounted in a fixed index sleeve 24, which is rigidly mounted in an aperture in the lateral extension 3 of the plate 2, which supports the governor as heretofore explained. This index shaft 23 has a reduced upper end 25 provided with screw threads, over which is keyed an index or finger 26, extending at right angles to the axis of the shaft, and held in engagement with the upper shoulder



der of the shaft by means of a nut 27 which engages over the threaded portion of the shaft. The index 26 bears against the upper end of the sleeve 24 and prevents downward  
5 motion of the shaft.

The index sleeve 24 is provided at its upper end with a flat annular flange 28, forming a dial which is graduated and  
10 numbered in a circle about its center to correspond to various speeds of the governor. The sleeve is also provided with a threaded lower end 29, and a nut 30 engag-  
15 ing therewith and against the under surface of the lateral extension 3 of the plate 2, and the dial at the upper end of the sleeve against the upper surface of the lateral extension 3 of the plate.

The index shaft 23 has an enlarged lower end forming a shoulder 31, bearing against  
20 the lower end of the index sleeve 24. The lower end of the shaft 23 is counter-sunk axially and is provided with an upwardly extending adjusting screw 32, threaded axi-  
25 ally into the shaft, and a spiral spring 33 surrounding the screw 32 and within said counter-sunk portion.

Slidably mounted upon the lower end of the index shaft 23 is a cam head 34 having  
30 substantially the form of a stepped cylinder, the upper and smaller end of which is recessed to receive the lower end of the index shaft, and the lower larger end of which is cupped and has a downwardly fac-  
35 ing inclined edge 35 forming a cam terminating in an oppositely inclined shoulder 35', connecting the uppermost and lowermost points of the cam by a gradual descent which permits of the passage of a cam  
40 follower over the shoulder without causing a shock tending to disarrange the mechanism.

Between the upper and lower recessed portions of the cam head 34, extends a web  
45 36 through which extends the adjusting screw 32. The spring 33 engages against the upper surface of the web and tends to keep the web in engagement against the upper surface of the head of the screw. A key-  
50 way 37 is provided in the lower end of the index shaft 23 and a pin or key 37' projects inwardly from the head 34 to engage in the keyway to prevent the head from rotat-  
55 ing with respect to the shaft, but to permit the head to slide longitudinally thereon. The inclined edge or cam 35 of the cam head bears against the outer end 22 of the brake lever 21, and through the lever controls the position of the brake shoes and the  
60 speed of the motor.

In the operation of this device, adjust-  
ment is made by means of the adjusting screw 32 in the lower end of the index shaft, until it is found that the speed of the turn-  
65 table corresponds with the indications upon the dial when the index or finger is set at

any particular division. In the arrange-  
ment illustrated in the drawings the gov-  
ernor and regulator depend from the cover  
of the casing, and to adjust the regulator  
it is necessary to lift the cover, and the  
70 regulator is thus normally concealed and protected from accidental displacement. After this adjustment is effected the index  
or finger 26 is moved to register with the  
75 division on the dial corresponding to the speed desired, thus rotating the cam against the brake lever and forcing the brake pads  
or shoes 17 into a predetermined position  
where they will engage with greater or less  
80 force against the friction disk 13, to control in a well known manner, the speed of the governor.

Although only one embodiment of this  
invention has been illustrated herein, it is  
obvious that this invention might also be  
85 applied to other forms of machines than the one shown, and that various changes might be made in the construction shown to adapt it to various purposes, and for other  
90 reasons, without departing from the spirit of this invention or the scope of the appended claims.

Having thus fully described my inven-  
tion, I claim and desire to protect by Let-  
ters Patent of the United States:—  
95

1. A speed regulator comprising a gov-  
ernor, a fixed member, a rotatable actuating  
member carried by said fixed member upon  
a fixed axis, coincident with the geometrical  
100 axis of said rotatable member, and fixed in position longitudinally of its axis of rota-  
tion, and means mounted upon and rotated  
by said rotatable member and adjustable  
thereon for regulating the speed of the gov-  
ernor.  
105

2. A speed regulator, comprising a gov-  
ernor, a fixed member, a rotatable actuating  
member carried by said fixed member upon  
a fixed axis, coincident with the geometrical  
110 axis of said rotatable member and fixed in position longitudinally of its axis of rota-  
tion, and a cam mounted upon and rotated  
by said rotatable member and adjustable  
thereon for regulating the speed of the gov-  
ernor.  
115

3. A speed regulator, comprising a gov-  
ernor, a fixed member, a rotatable actuating  
member carried by said fixed member upon  
a fixed axis, coincident with the geometrical  
120 axis of said rotatable member, and fixed in position longitudinally of its axis of rota-  
tion, and a cam mounted upon said rotatable  
member and actuated thereby and adjust-  
able longitudinally of the axis of rotation  
thereof for regulating the speed of the gov-  
ernor.  
125

4. A speed regulator, comprising a gov-  
ernor, a fixed member, a rotatable member  
carried by said fixed member, a cam carried  
130 by said rotatable member and adjustable

and slidable longitudinally of the axis of rotation thereof, and a key sliding in a key-way provided therefor between said cam and said rotatable member to hold said cam slidably in position for regulating the speed of the governor.

5 5. A speed regulator, comprising a governor, a fixed member, a rotatable member carried by said fixed member, a cam carried by said rotatable member, and means for adjusting said cam longitudinally with respect to the axis of said rotatable member, said means comprising a screw and a spring.

10 6. A speed regulator, comprising a governor, a rotatable actuating member mounted upon a fixed axis, coincident with the longitudinal axis of said rotatable member, a cam rotated by said rotatable member, and adjustable longitudinally with respect to the axis of rotation thereof, and means whereby when said actuating member is stationary, said governor will be controlled to rotate at a predetermined rate.

15 7. A speed regulator, comprising a governor, a rotatable member, a fixed member carrying said rotatable member, a cam slidably mounted upon one end of said rotatable member, a screw adjustable in said rotatable member for limiting the longitudinal motion of the cam in one direction and a spring between said rotatable member and said cam for holding said cam in engagement with said screw.

20 8. A speed regulator comprising a governor, a fixed member, a rotatable actuating member carried by said fixed member upon a fixed axis, coincident with the geometrical axis of said rotatable member and fixed in position longitudinally of its axis of rotation, and means mounted upon and rotated by said rotatable member and adjustable longitudinally thereof for regulating the speed of the governor.

25 9. A speed regulator, comprising a governor, a fixed sleeve provided with a dial at one end and having its opposite end threaded, a nut upon said threaded end to retain the sleeve in position, a shaft rotatably mounted within said sleeve, said shaft having one end reduced and threaded, and its opposite end enlarged to form a shoulder bearing against one end of said fixed sleeve, an index fixed upon said reduced end and a cam adjustably mounted upon said enlarged end for regulating the speed of the governor.

30 10. A speed regulator, comprising a governor, a fixed sleeve provided with a dial at one end and having its opposite end threaded, a nut upon the threaded end to retain the sleeve in position, a shaft rotatably mounted within said fixed sleeve, said shaft having one end reduced and threaded, and its opposite end enlarged and counter-sunk, a screw engaging said enlarged end

through said counter-sunk portion, yielding means seated in said counter-sunk portion surrounding said screw, a cam adjustably mounted upon said enlarged end and held in position by means of said screw and said yielding means, and means between said cam and said governor whereby the speed is varied in accordance with the rotation of said shaft as shown by the index of said dial.

35 11. A speed regulator, comprising a governor, a fixed sleeve provided with a dial at one end and having its opposite end threaded, a nut upon said threaded end to retain the sleeve in position, a shaft rotatably mounted within said fixed sleeve, said shaft having one end reduced and threaded, and its opposite end enlarged and counter-sunk, a screw engaging said enlarged end through said counter-sunk portion, yielding means seated in said counter-sunk end surrounding said screw, a cam slidably mounted upon said enlarged end by means of a key sliding in a key-way, said cam being held in position longitudinally by means of said yielding means and screw, and means between said cam and said governor whereby the speed of said governor is varied in accordance with the rotation of said shaft as shown by the index upon the dial.

40 12. A speed regulator, comprising a governor, a fixed member, a shaft rotatably mounted thereby, a head adjustably secured to one end of said shaft and having a cupped outer end with inclined edges forming a cam, and means between the cam and said governor whereby the speed of said governor is varied in accordance with the rotation of said shaft.

45 13. A speed regulator comprising a governor, a fixed member, a shaft rotatably mounted by said fixed member, a head slidably mounted upon said shaft, said head having one end counter-sunk to fit over the end of the said shaft and its opposite end cupped and provided with inclined edges forming a cam, means for adjusting the head in various positions upon the shaft, and means between the head and governor whereby the speed of the governor is varied in accordance with the amount of rotation of said shaft.

50 14. A speed regulator, comprising a governor, a fixed member, a shaft rotatably mounted by said fixed member, a head slidably mounted upon said shaft, said head having one end counter-sunk to fit over the end of the shaft, and its opposite end cupped and provided with an inclined edge forming a cam, means for adjusting the head in various positions upon the shaft and means between the head and governor whereby the speed of the governor is varied or entirely checked in accordance with the rotation of said shaft, said means comprising a spring and screw and a key sliding in a key-way.



15. A speed regulator, comprising a governor, a rotatable member, a fixed member carrying said rotatable member, a cam carried by said rotatable member, and a screw  
5 and a spring for adjusting said cam to vary the speed of the governor.

16. A speed regulator, comprising a governor, a fixed sleeve provided with a dial at one end and having its opposite end  
10 threaded, a nut upon said threaded end to retain the sleeve in position, a shaft rotatably mounted within said sleeve, said shaft having one end threaded and its opposite end enlarged to form a shoulder bearing  
15 against one end of said fixed sleeve, an index fixed upon said threaded end, and a cam upon said enlarged end for regulating the speed of the governor.

17. A speed regulator, comprising a governor, a cam mounted to yield in one direction but fixed in the opposite direction for  
20 controlling the speed of the governor, and means whereby when said cam is held in a fixed position said governor will be restrained to move at a predetermined rate.

18. A speed regulator, comprising a governor, a rotatable shaft, a cam slidably mounted upon said shaft for varying the  
30 speed of said governor, said cam being yieldingly restrained in one direction and fixed in the opposite direction, and means whereby when said shaft is held in a fixed position said governor will be restrained to rotate at a predetermined rate.

19. A speed regulator, comprising a governor, a rotatable shaft, a cam splined to said shaft and yieldingly restrained with  
35 respect to said shaft in one direction but fixed in the opposite direction, to control the speed of the governor, and means whereby when said cam is held stationary said governor will be restrained to move at a predetermined rate.

20. In a speed regulator, the combination  
45 with an index rotatable about a fixed axis and a graduated index plate, of a governor, yielding means rotatable with said index for varying the speed of the governor, and means for adjusting the position of said

speed varying means to cause the governor  
50 to rotate at speeds corresponding to the graduations on said plate.

21. In a speed regulator, the combination with an index rotatable about a fixed axis, of a governor, yielding means rotatable with  
55 said index for varying the speed of the governor, and means for adjusting the position of said speed varying means to cause the governor to rotate at speeds corresponding to the indications of said index.

22. A speed regulator comprising a governor, a fixed sleeve provided with a dial at one end and having its opposite end threaded, a nut upon said threaded end to retain  
60 said sleeve in position, a shaft rotatably mounted in said sleeve, an index carried by said shaft, adjacent said dial, a shoulder upon said shaft bearing against one end of said fixed sleeve, and means upon said shaft for regulating the speed of the governor.

23. A speed regulator comprising a governor, a fixed sleeve provided with a dial at one end and having its opposite end threaded, a nut upon said threaded end to retain  
75 said sleeve in position, a shaft rotatably mounted in said sleeve, an index carried by said shaft, adjacent said dial, a shoulder upon said shaft bearing against one end of said fixed sleeve, and a cam upon said shaft for regulating the speed of the  
80 governor.

24. A speed regulator comprising a governor, a fixed sleeve provided with a dial at one end, a shaft rotatably mounted within  
85 said sleeve, said shaft having one end threaded, and its opposite end enlarged to form a shoulder bearing against one end of said fixed sleeve, an index fixed upon said threaded end, adjacent said dial, and means upon said enlarged end for regulating the  
90 speed of the governor.

In witness whereof I have hereunto set my hand this 30th day of January, 1907.

WILBURN N. DENNISON.

Witnesses:

ALSTON B. MOULTON,  
ALEXANDER PARK.

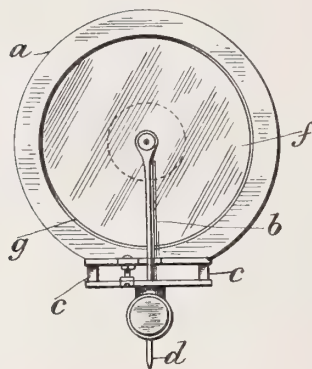


E. DE LA RUE.  
SOUND BOX FOR TALKING MACHINES AND OTHER ACOUSTICAL INSTRUMENTS.  
APPLICATION FILED APR. 21, 1911.

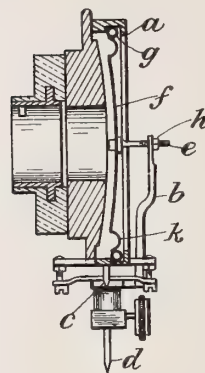
1,040,648.

Patented Oct. 8, 1912.

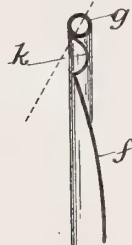
*Fig. 2.*



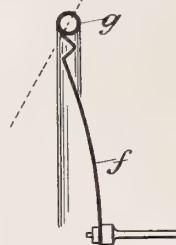
*Fig. 1.*



*Fig. 3.*



*Fig. 4.*



*Witnesses:-*  
*Henry B. Thorne.*  
*F. George Barry.*

*Inventor:-*  
*Ernest de la Rue.*  
*by his attorneys*  
*Mowatt & Ward*

# UNITED STATES PATENT OFFICE.

ERNEST DE LA RUE, OF LONDON, ENGLAND.

SOUND-BOX FOR TALKING-MACHINES AND OTHER ACOUSTICAL INSTRUMENTS.

1,040,648.

Specification of Letters Patent.

Patented Oct. 8, 1912.

Application filed April 21, 1911. Serial No. 622,531.

*To all whom it may concern:*

Be it known that I, ERNEST DE LA RUE, a subject of the King of Great Britain, and resident of London, England, have invented a new and useful Improvement in Sound-Boxes for Talking-Machines and other Acoustical Instruments, of which the following is a specification.

The present invention relates to improvements in sound boxes for talking machines and other acoustical instruments.

According to the present invention, I mount a diaphragm within a casing so that it is capable of reciprocating, and to this end my invention consists in mounting the diaphragm in such a manner that it is held resting upon a single resilient support at the periphery, and my invention further consists in so arranging the resilient support and so constructing the periphery of the diaphragm that the support does not exercise a thrust upon the diaphragm in a direction at right angles to the plane of the diaphragm but makes contact with the periphery of the diaphragm so as to exercise a thrust thereon in an oblique direction whereby the resiliency of the support is increased and the reciprocating action of the diaphragm is facilitated.

In the accompanying drawings, a talking machine sound box is illustrated in which my invention is embodied.

Figure 1 shows a sectional elevation of a sound box with my improvements applied thereto. Fig. 2 a front elevation thereof. Fig. 3 shows an exaggerated detail of a portion of a diaphragm and gasket. Fig. 4 a similar view to Fig. 3, but showing a variation of the corrugation of the periphery of the diaphragm.

Upon the casing *a* is mounted in any usual or convenient manner the stylus bar *b* capable of oscillating about bearings *c* and carrying at its lower end the reproducing needle *d*. Through the upper end of the stylus bar *b* passes the rod *e* which is connected at its inner end to the diaphragm *f*. The diaphragm rests against a single resilient gasket *g* and the diaphragm *f* can be drawn up against the gasket *g* with any desired tension and held in any desired position by means of the nut *h* (or equivalent means) which is adjustable upon the threaded end of the rod *e*. After proper adjustment, the nut will be fixed by waxing, soldering or the like. The bearings *c* of the

stylus bar will then exercise any desired tension upon the diaphragm *f*.

My invention differs from known forms of sound box in which the diaphragm is held in tension within its mounting by means of an adjustable connection between the diaphragm and the stylus bar in that in the sound boxes hitherto known the diaphragm has been mounted between two gaskets but not resting merely upon a single gasket or other resilient support as is the case in the present invention. I have found that if the periphery of the diaphragm is constrained at one side only, an improved reproduction is obtained.

I provide the diaphragm *f* at its periphery with a rib or corrugation *k* (shown more particularly in the exaggerated view Fig. 3) and the size of the diaphragm is so selected with regard to the gasket *g* that the corrugation *k* does not rest with its bottom upon the gasket *g* but makes contact with the gasket with its outer side. Owing to this disposition the resilient support does not exercise a thrust upon the diaphragm *f* in a direction at right angles to the plane of the diaphragm but exercises an oblique thrust thereon so that when the diaphragm is vibrated by the stylus, the gasket does not offer so much resistance to its movements and a slight rolling motion may take place between the resilient support and the corrugated periphery of the diaphragm. One angle of the line of thrust is indicated in Fig. 3 and Fig. 4 by means of dotted lines. Instead of making the corrugation *k* U-shaped as shown in Fig. 3 I make it substantially V-shaped as shown in Fig. 4.

The diaphragm is preferably constructed with a dished or coned central portion as shown, for instance, in Figs. 3 and 4 respectively, in order to increase in the manner already well understood the rigidity of the central or operative portion. The U or V-shaped corrugation running around the periphery of the substantially rigid central portion *f* adds to the resiliency of the mounting of the diaphragm, quite apart from the resiliency obtained from the position of the gasket *g*.

Claims:

1. In a sound box for acoustical instruments, a diaphragm having a substantially rigid central portion and supported at its periphery upon a single resilient support of circular section at one side of the diaphragm



and exercising upon said support an oblique thrust relatively to the direction of reciprocation of the diaphragm, a stylus bar and an adjustable tie between the diaphragm and stylus bar adapted to draw the diaphragm against the resilient support.

2. In a sound box for acoustical instruments, a diaphragm having a dished central portion, and supported at its periphery upon a single resilient support of circular section at one side of the diaphragm and exercising upon said support an oblique thrust relatively to the direction of reciprocation of the diaphragm, a stylus bar and an adjustable tie between the diaphragm and stylus bar adapted to draw the diaphragm against the resilient support.

3. In a sound box for acoustical instruments, a diaphragm having a substantially rigid central portion, and a peripheral corrugation supported at one side by a resilient support of circular section and exercising upon said support an oblique thrust relatively to the direction of reciprocation of the diaphragm, a stylus bar and an adjustable tie between the diaphragm and stylus bar adapted to draw the diaphragm against the resilient support.

4. In a sound box for acoustical instru-

ments, a diaphragm having a peripheral corrugation with which it rests upon a resilient support of circular section at one side of the diaphragm and exercising upon said support an oblique thrust relatively to the direction of reciprocation of the diaphragm, a stylus bar and an adjustable tie between the diaphragm and stylus bar adapted to draw the diaphragm against the resilient support.

5. In a sound box for acoustical instruments, a diaphragm having a peripheral corrugation of substantially U section with which it rests upon a resilient support of circular section at one side of the diaphragm and exercising upon said support an oblique thrust relatively to the direction of reciprocation of the diaphragm, a stylus bar and an adjustable tie between the diaphragm and stylus bar adapted to draw the diaphragm against the resilient support.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this first day of April 1911.

ERNEST DE LA RUE.

Witnesses:

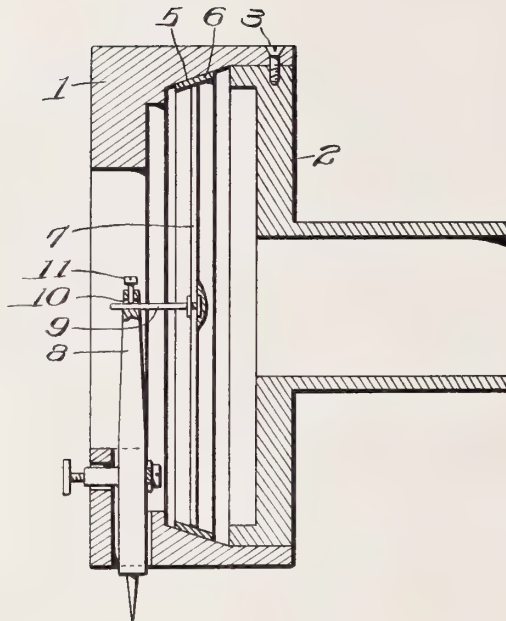
M. BURRIDGE,  
W. Y. WEED.



E. R. JOHNSON.  
SOUND BOX FOR TALKING MACHINES.  
APPLICATION FILED APR. 22, 1902.

1,041,799.

Patented Oct. 22, 1912.



WITNESSES

*W. G. Hartman.*

*Alston Moulton*

BY

INVENTOR  
*Eldridge R. Johnson*

*Wm. T. Kelly*

ATTORNEY

# UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

## SOUND-BOX FOR TALKING-MACHINES.

1,041,799.

Specification of Letters Patent.

Patented Oct. 22, 1912.

Application filed April 22, 1902. Serial No. 104,162.

*To all whom it may concern:*

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Sound-Boxes for Talking-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

The main objects of this invention are to provide in a sound box an improved mounting for a diaphragm; improved means of connection between a diaphragm and a stylus bar; and to provide other improvements as will appear hereinafter.

Referring to the drawing, the figure thereon is a longitudinal section of a sound box embodying my invention.

Referring to the drawing, one embodiment of this invention comprises a casing consisting of two sections, an annular front section 1, adapted to carry a stylus bar and a diaphragm, and rear section 2 adapted to be attached to a horn or sound amplifying or sound conducting device. These two sections may be secured together in any suitable manner, as for instance, by having the rear section telescope snugly within the rear end of the front section, and held in position by means of a set screw 3.

To form a suitable support for a diaphragm, the inner surface of the front section 1 of the casing is provided with a conical or tapering surface forming an annular seat 5, which preferably tapers in a direction away from the rear section 2 of the casing. It is not essential, however, that this seat should taper, although the tapering form facilitates the assembling of the parts of the sound box, and is otherwise advantageous, as will appear hereinafter.

Secured to the seat 5, by means of a suitable cement, is an elastic ring or pad 6, which conforms to the contour of the seat. In the instance illustrated this ring is practically uniform in thickness and conical in shape. Surrounded and supported by the ring 6 is a diaphragm 7 of the usual or any suitable construction. A small quantity of elastic cement such as rubber or any other suitable elastic cement, is applied to the periphery of the diaphragm, and adheres to the inner surface of the pad or ring 6, holding the diaphragm in position in the ring 6. If preferred, the ring 6 might be omitted

and the circumferential surface of the diaphragm secured by the yielding cement directly to the seat 5 of the casing.

A stylus bar 8 is yieldingly connected to the front section 1 of the casing, and is connected to the diaphragm by means of a wire 9, one end of which is secured to the diaphragm and the other end of which projects through an aperture 10 provided therefor in the inner end of the stylus bar, and is held in place by a set screw 11, threaded longitudinally through the inner end of the stylus bar and engaging the wire.

One of the advantages of this construction is, that by loosening the set screw 11, the wire 9 may be withdrawn from the stylus bar and the diaphragm may be removed from its seat without breaking the wire or destroying its connection with the diaphragm. This manner of connecting the diaphragm to the stylus bar also permits the diaphragm to be cemented in the casing in any convenient position without careful consideration of its distance from the inner end of the stylus bar, and then the wire 9 may be readily secured to the stylus bar without bringing any undesirable tension upon the diaphragm. Another advantage of this construction is that by having the seat 5 upon which the diaphragm is mounted, tapering as described, not only may the diaphragm and its annular ring be conveniently positioned in the casing but also more or less space may be allowed, if desired, between the ring and the casing and between the circumferential surface of the diaphragm and the ring for the yielding cement, by simply varying the positions of the ring and diaphragm, or the diaphragm might be secured by the cement directly to the tapering seat of the casing if preferred, without making any change other than to omit the ring and to readjust the diaphragm and its connection to the casing and stylus bar accordingly. A further advantage of this construction is that as the diaphragm is held in position only by the elastic cement in contact with the circumferential surface of the diaphragm, the plane surfaces or opposite sides of the diaphragm are free from contact with any part of the sound box casing or mounting of the diaphragm. The diaphragm is thus free to flex and vibrate through its entire area, and will respond faithfully to the most minute vibrations of the stylus bar or to the slightest sound



vibrations of the atmosphere, and excellent results in sound recording and reproducing may therefore be attained.

Although only a single form has been illustrated in which this invention may be embodied, the invention is not limited to the specific form shown, but obviously may be embodied in various forms without departing from the spirit of the invention or the scope of the appended claims.

Having thus described my invention what I claim and desire to secure by Letters Patent, is:—

1. In a sound box, the combination with a support, of a diaphragm located therein, and an inclined bearing surface for the periphery of said diaphragm.

2. In a sound box, the combination with a support, of a diaphragm located therein, an inclined bearing surface on the interior of the support, an elastic covering for said inclined bearing surface against which the circumferential surface of the diaphragm rests and an elastic cement connecting said circumferential surface and said bearing surface.

3. In a sound box, the combination with a casing, of a ring in said casing and having a tapering internal surface, and a diaphragm having its circumferential surface resting adjacent the tapering internal surface of said ring and cemented thereto.

4. In a sound box, the combination with a casing of a diaphragm, an inclined seat supported in the casing adjacent which the peripheral edge of the diaphragm rests, a stylus bar mounted on the casing, and an adjustable connection between said stylus bar and said diaphragm whereby said diaphragm may be properly adjusted on its seat.

5. The combination with a sound box casing, of a diaphragm located therein, cement holding said diaphragm in position, a stylus bar yieldingly mounted on said casing, a pin rigidly secured to the diaphragm, said stylus bar being provided with an aperture through which said pin passes, and a set screw for holding the pin in position with respect to the bar.

6. In a sound box, the combination with a casing of a diaphragm, and a ring having an interior conical surface, said diaphragm being supported within said ring and having substantially the entire surface of its side faces free from contact.

7. In a sound box, the combination with a casing, of a diaphragm, and a ring having an interior conical surface, the said diaphragm having substantially the entire surfaces of its side faces free from contact with said ring, and means supporting said diaphragm at its periphery within said ring.

8. In a sound box for talking machines, a diaphragm having a narrow, circumferential surface, and means having an interior conical surface contacting only with said circumferential surface of said diaphragm for supporting the same within said sound box.

9. In a sound box for talking machines, the combination of a support for a diaphragm, a diaphragm having a narrow, circumferential surface, and means having an interior conical surface attached to said support and to said diaphragm by said circumferential surface only for holding the latter in position.

10. In a sound box for talking machines, the combination with a support having an interior conical surface, of a diaphragm located therein, and cement upon the circumferential surface only of said diaphragm, the plane surfaces of said diaphragm being substantially entirely free from the cement.

11. In a sound box for talking machines, the combination with a support having an interior conical surface, of a diaphragm located therein and elastic cement connecting said support with the circumferential curved surface only of said diaphragm, the plane surfaces being substantially entirely free from the cement.

12. In a sound box, the combination of a support having an inclined bearing surface, a diaphragm located within the same and having the circumferential surface of its edge adjacent said inclined surface, and elastic cement between said surfaces for holding said diaphragm in place.

13. The combination with a diaphragm, of conical means contacting substantially only with the peripheral edge of said diaphragm for holding said diaphragm in position.

14. In a sound box, the combination with a casing, of a diaphragm, a stylus bar connected to said diaphragm and yieldingly connected to said casing, said casing being provided with an internal annular surface surrounding and supporting said diaphragm and tapering toward said stylus bar.

15. In a sound box, the combination with a casing, of a diaphragm, a stylus bar yieldingly connected to said casing, and an adjustable connection between said diaphragm and said stylus bar, said casing being provided with an internal annular surface surrounding and supporting said diaphragm and tapering toward said stylus bar.

In witness whereof I have hereunto set my hand this 15th day of April, A. D., 1902.

ELDRIDGE R. JOHNSON.

Witnesses:

E. H. WILLARD,

JAS. G. STIKELEATHER.



J. A. RABBITT.  
TALKING MACHINE.  
APPLICATION FILED FEB. 28, 1910.

1,041,871.

Patented Oct. 22, 1912.

3 SHEETS—SHEET 1.

Fig. 1,

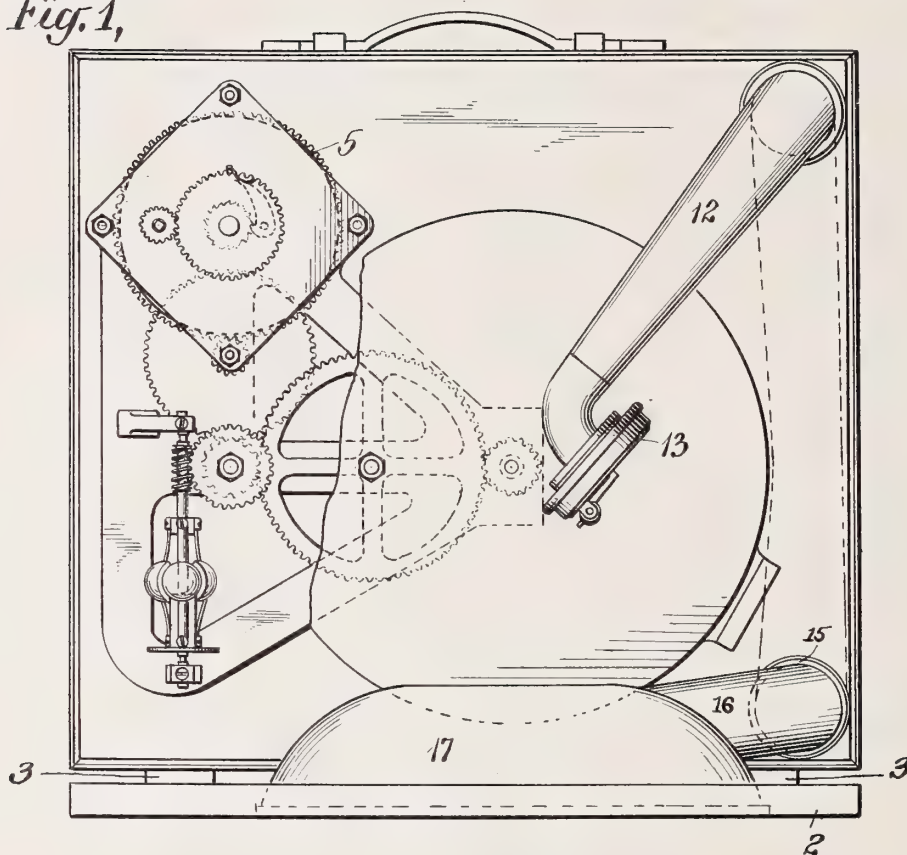
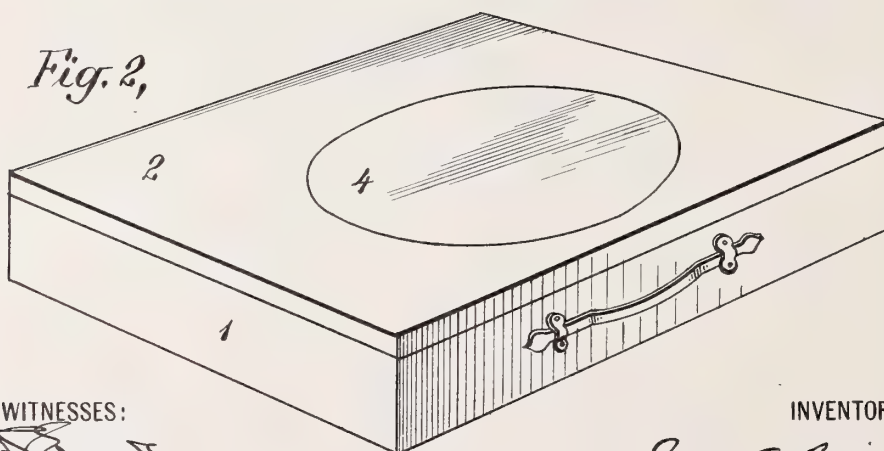


Fig. 2,



WITNESSES:

*H. Edwards.*  
*Henry Meyer.*

INVENTOR

*James A. Rabbitt*  
BY *H. Edwards*  
ATTORNEY



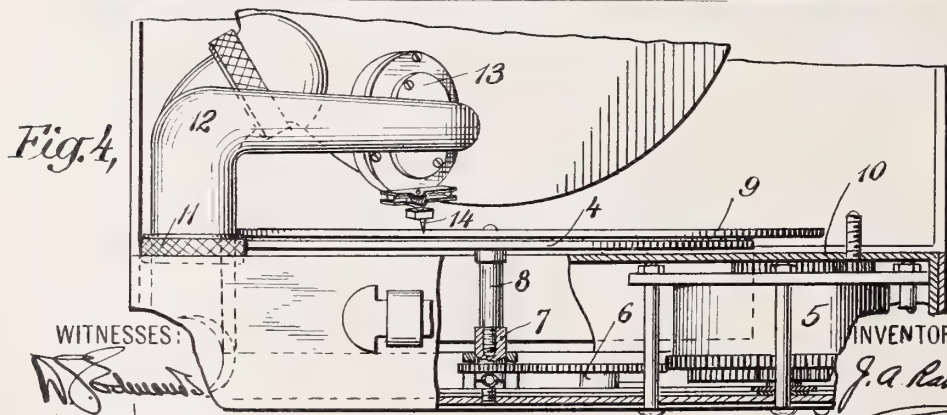
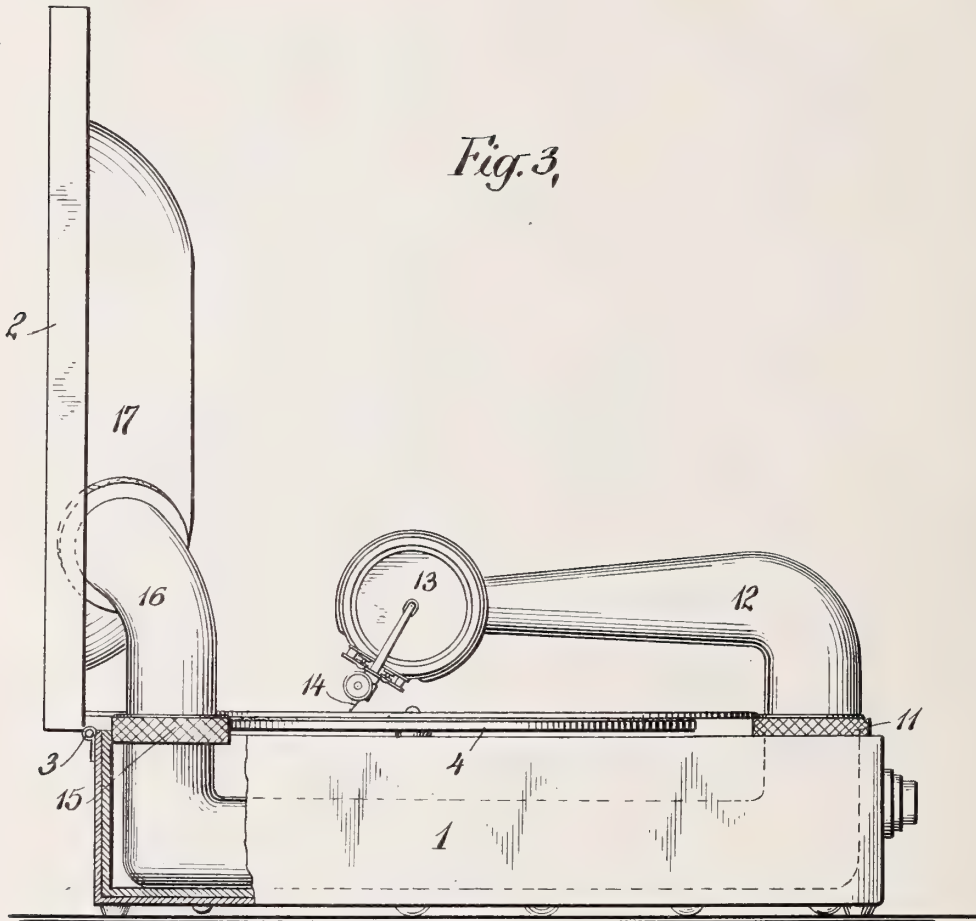


J. A. RABBITT.  
TALKING MACHINE.  
APPLICATION FILED FEB. 28, 1910.

1,041,871.

Patented Oct. 22, 1912.

3 SHEETS—SHEET 2.



WITNESSES:

*W. Edwards*  
*Henry Meyer*

INVENTOR

*J. A. Rabbit*

BY

*W. Edwards*

ATTORNEY



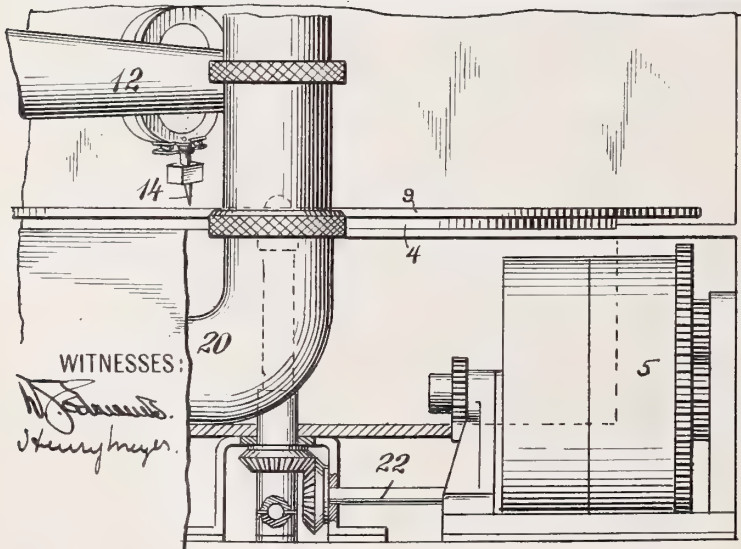
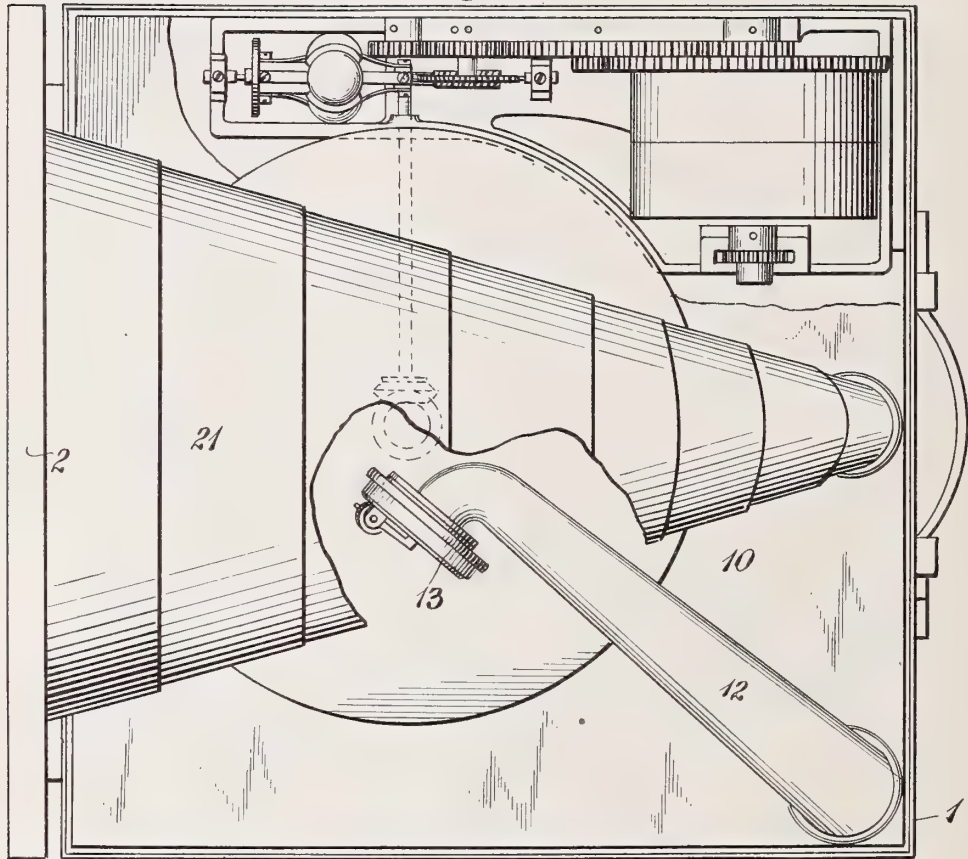
J. A. RABBITT.  
TALKING MACHINE.  
APPLICATION FILED FEB. 28, 1910.

1,041,871.

Patented Oct. 22, 1912.

3 SHEETS—SHEET 3.

*Fig. 5,*



*Fig. 6,*

WITNESSES:  
*W. Edwards*  
*Henry Meyer*

INVENTOR  
*James A. Rabbitt*  
BY *W. Edwards*  
ATTORNEY

# UNITED STATES PATENT OFFICE.

JAMES A. RABBITT, OF YOKOHAMA, JAPAN.

## TALKING-MACHINE.

1,041,871.

Specification of Letters Patent.

Patented Oct. 22, 1912.

Application filed February 28, 1910. Serial No. 546,269.

*To all whom it may concern.*

Be it known that I, JAMES A. RABBITT, a citizen of the United States, residing in the city of Yokohama, Empire of Japan, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

This invention relates to talking-machines and is directed to the provision of a machine which is exceedingly light and the parts of which may be conveniently and compactly arranged within a suitable casing, so that the machine may be readily carried by hand from place to place.

My improved machine preferably comprises a casing, one side of which is hinged to the body portion of the casing, this hinged side having an opening therein adapted to receive the end of an amplifying-horn to support the latter. When the machine is not in use, this opening is closed by a circular metallic plate, and this plate forms the turntable for receiving the disk sound-record. The amplifying-horn may be made sufficiently shallow to fit within the relatively small casing of the machine, or, if desired, a collapsible horn of ample size may be employed which can be folded so as to occupy but little space.

I have illustrated the preferred embodiment of my invention in the accompanying drawings, in which—

Figure 1 is a top view of the machine, broken away in part; Fig. 2 is a perspective view, showing the casing closed; Fig. 3 is a side elevation, partly in section; Fig. 4 is a front view, partly in section; Fig. 5 is a top view, broken away in part, illustrating a modification; and Fig. 6 is a side view, broken away in part, showing the construction illustrated in Fig. 5.

Referring first to Figs. 1 to 4, the casing for the machine consists of a body portion 1 and a top 2 hinged at 3 to the body portion 1. In the removable side 2 of the casing is a circular opening, and this opening is closed by a circular metallic plate 4 secured to the removable side 2 in any suitable manner. Within the body portion of the casing 1, is mounted a suitable spring-motor having a windable spring within the barrel 5, operating through gearing 6 to rotate a

central shaft 7. This shaft has a threaded opening therein adapted to receive the threaded end of a short shaft 8. When the machine is in use, the plate 4 is secured upon the upper end of the short shaft 8, as shown in Fig. 4, and receives the disk sound-record 9. The body portion 1 of the casing of the machine may have an inner cover-plate 10 secured thereto, covering the motor 5 and having an opening in it through which the winding-shaft of the motor extends. Secured to this cover-plate 10 at one corner of the casing is a tubular member 11, upon which is pivotally mounted a tapering tone-arm 12 having its larger end turned downwardly and entering the member 11. To the smaller end of this tone-arm is secured a sound-box 13 having its stylus 14 adapted to track in the groove of the record upon the turn-table 4. The tone-arm 12 is adapted to turn relatively to the tubular member 11 about a vertical axis, or if desired the connection of the tone-arm 12 to the tubular member 11 may be such that the tone-arm can turn freely about both vertical and horizontal axes. The tubular member 11 is extended along one side of the casing 1 from the corner thereof where the tone-arm is mounted to the adjacent corner, as indicated by the dotted lines in Fig. 1, and at this corner it is turned upwardly and passes again through the plate 10, as shown at 15. The end 15 of this tubular sound-conveying passageway is adapted to receive one end of a tubular coupling 16 which connects with a sound-amplifying device. In the drawings I have shown the coupling 16 as a short tube connected at one end to the end 15 of the sound-conveying passageway and at the other end to a shallow amplifying-horn 17. This amplifying-horn preferably has the form of a metallic pan with its larger end received in the opening in the removable side 2 of the casing, the latter forming a support for the horn 17. In the side of the horn is an opening, formed to facilitate connecting the tubular member 16 to the horn 17.

It will be seen that the major portion of the mechanism of the spring-motor is arranged within the casing beyond the periphery of the turn-table 4, and that the connec-



tion from this portion of the motor mechanism to the central shaft of the machine is effected by means of gears lying close to the bottom of the casing. For this reason, when the turn-table 4 is removed from the shaft 8, ample space remains for the reception of the shallow horn 17, by placing the horn in an inverted position over the shaft 8. If desired, however, the short shaft 8 may be readily disconnected from the shaft 7, and in this way even greater space is provided. The joints connecting the tubular member 16 and the tone-arm 12 with the sound-conveying passageway 11 and the joint between the tubular member 16 and the horn 17 are such that these parts may be readily disconnected, and they may be arranged within the casing 1, in the space therein beyond the periphery of the turntable. Preferably the sound-box is so arranged that it may be disconnected from the tone-arm 12, and supporting devices may be provided within the casing of the machine to hold these more delicate parts and thus avoid injury thereto while transporting the machine.

Referring to Figs. 5 and 6, I have shown a somewhat different construction, whereby the same results are obtained and an amplifying-horn of very much greater size may be used. In this form of my invention, the amplifying-horn consists of a collapsible horn, one end of which enters the opening in the removable side of the casing, so that the horn is supported thereby. In this form of my invention, the sound-conveying passageway 20 within the casing of the machine extends from the tone-arm 12 along the side of the casing opposite that to which the removable cover 2 is hinged, to a point at about the middle of that side, where it is turned upwardly and passes through the inner cover-plate 10 of the machine. A collapsible horn is shown at 21, consisting of a plurality of sections which when extended form a tapering horn of the form shown. This horn at one end connects with the upwardly turned end of the tubular sound-conveying passageway 20, and at its other end enters the opening in the hinged cover-plate 2. In this form of my invention, I have shown the spring-motor as somewhat differently arranged, the connection from the motor to the shaft of the turn-table being formed by a shaft 22. This shaft, however, is arranged at the bottom of the casing of the machine, so that when the turntable is removed from its shaft ample space is provided for the reception of the horn 21 when the latter is in its collapsed condition.

Having now described my invention, what I claim as new therein and desire to secure by Letters Patent is as follows:—

1. A portable talking-machine comprising the combination of a motor-box having a

body and a top which is hinged to the body and which has an opening therethrough, a motor mounted within the box, a turn-table detachably mounted on a shaft of the motor and adapted to be secured to said top in position to close said opening therethrough, an amplifying device adapted to lie in inoperative position within the box, means for removably supporting the amplifying device in operative position upon the body of the box and upon said hinged top in which position it directs sound through said opening in the top, and sound-reproducing mechanism adapted to be connected to said amplifying device, substantially as set forth.

2. A portable talking-machine comprising the combination of a motor-box provided with a cover-plate and with a hinged top which has an opening therethrough, a motor mounted within the box, a turn-table detachably mounted on a shaft of the motor and adapted to be secured to said top in position to close said opening therethrough, an amplifying device adapted to lie in inoperative position within the box, means for removably supporting the amplifying device upon said cover-plate and said top in position to direct sound through the opening in the top, a tone-arm pivotally mounted on said cover-plate, a reproducer carried thereby, and a sound-passageway below the cover-plate connecting the tone-arm and amplifying device, substantially as set forth.

3. The combination of a casing comprising a body and a cover therefor having an opening therethrough and movable to closed and open positions, a motor mounted within the body, a turntable driven thereby, a tone-arm pivotally mounted on the body adjacent to the turntable, a sound-box carried by the tone-arm and movable across the record on said turntable, and a tubular amplifying horn supported at one end upon said body and near the other upon said cover when the latter is in the open position, in position to direct sound passing therethrough through said opening in the cover, substantially as set forth.

4. A portable talking-machine comprising a motor-box, a hinged wall for the box having an opening therethrough, a motor mounted within said box adjacent to one of the side walls thereof, a shaft distant from the motor, gearing between the motor and said shaft located adjacent to the bottom of the box, a turntable mounted on said shaft, a sound-box, and a sound-amplifying device connected to said sound-box and supported in operative position by said hinged wall when the latter has been turned relatively to the box, in position to direct sound passing therethrough through the opening in said wall, said turntable being removable from the shaft on which it is mounted to provide space above said gearing for the re-

ception of said sound-amplifying device, and  
said turn-table being adapted to be secured  
to the hinged wall of the box in position to  
close the opening therethrough when the am-  
plifying device has been detached from the  
hinged wall and is in inoperative position,  
substantially as set forth.

This specification signed and witnessed  
this 5th day of February, 1910.

JAMES A. RABBITT.

Witnesses:

GENJI KURIBANE,  
MASATARO O'KASAVA.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."

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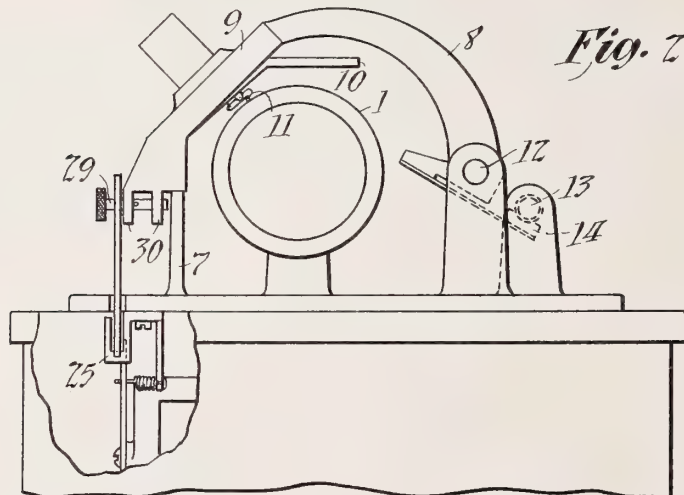
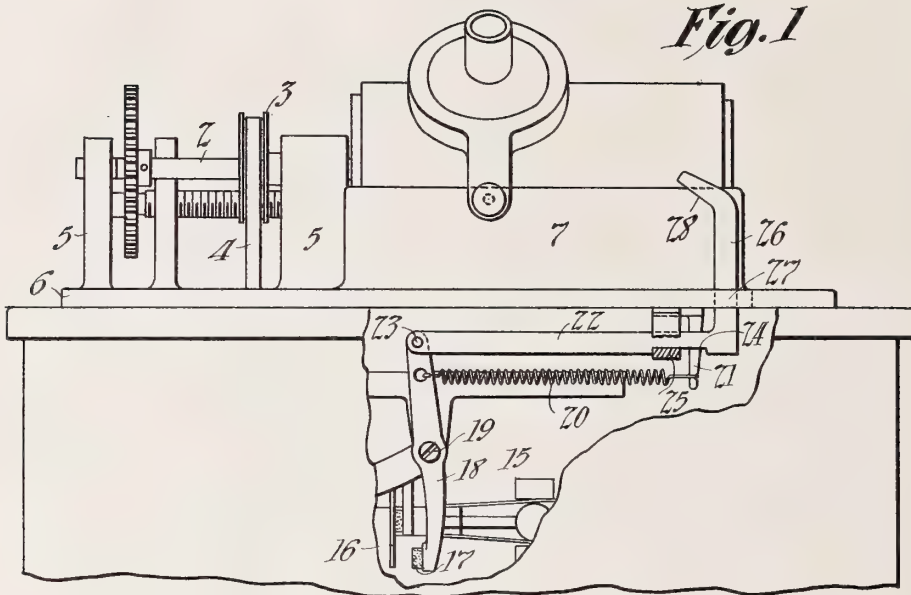


P. WEBER.  
PHONOGRAPH.

APPLICATION FILED APR. 2, 1909.

1,041,922.

Patented Oct. 22, 1912.



*Witnesses:*  
Frank D. Lewis  
Dyer Smith

*Inventor*  
Peter Weber  
By Frank L. Ayer  
*Atty.*

# UNITED STATES PATENT OFFICE.

PETER WEBER, OF ORANGE, NEW JERSEY. ASSIGNOR. BY MESNE ASSIGNMENTS. TO  
THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH.

1,041,922.

Specification of Letters Patent.

Patented Oct. 22, 1912.

Application filed April 2, 1909. Serial No. 487,563.

*To all whom it may concern:*

Be it known that I, PETER WEBER, a citizen of the United States, and a resident of Orange, in the county of Essex and State of New Jersey, have made a certain new and useful Invention in Phonographs, of which the following is a description.

My invention relates to phonographs and similar talking machines in which provision is made for automatically stopping the rotation of the mandrel when the end of the record has been reached, and more particularly to instruments of this character in which a spring motor is used for furnishing the driving power.

My invention has for its object the application of such means to phonographs as now built and on the market, and also to simplify the structure and render the same more efficient.

My invention is an improvement over that shown in United States Patent No. 1,002,479, granted to Edward L. Aiken on September 5, 1911, one of the chief points of such improvement being the provision of contacting means carried by the movable carriage and a member attached to the brake device of such character that by the contacting of such members on the traveling carriage reaching the end of the record, the carriage will be held more firmly on its seat, with the surface of the arm of the carriage firmly contacting the top of the straight edge, and the stylus remaining in contact with the record. With the contour of the cam contact devices previously used, the tendency is for the traveling carriage to be lifted by the first contact of the contacting parts, the arm of the carriage riding up the cam surface, so that the feed nut may be disengaged from the feed screw before the stopping device has been fully applied, whereby the progression of the carriage will be immediately stopped, thus rendering the stopping device inoperative.

With the ends heretofore set forth in view, my invention consists in the features hereinafter set forth and claimed.

Reference is hereby made to the accompanying drawing, in which—

Figure 1 is a side elevation of a phonograph embodying my invention, the casing being partly broken away to disclose the braking device for the motor, and the gov-

ernor. Fig. 2 is an end elevation of the same.

Referring to the drawings, the mandrel 1 mounted on the shaft 2 is driven by means of the belt wheel 3 which is rotated by a belt 4, the latter being driven from a motor not shown. The standards 5 carrying the necessary bearings rise from the bed plate 6, on which is also mounted the straight edge 7. The traveling carriage 8 is provided with sound box 9, floating weight 10 and stylus 11 in contact with the record on mandrel 1, the traveling carriage being slidably mounted on guide rod 12, and fed from feed screw 13 by feed nut 14, all of which is common.

The governor 15 of the motor is provided with a sliding regulator disk 16, with which the pad 17 of felt or other yielding material carried by the end of the lever 18 pivoted on the screw 19, is adapted to coöperate to regulate or stop the motor, as is well known. The spiral spring 20 is attached to the lever 18, the other end of the spring 20 being fastened to a lug 21 mounted on the under side of base plate 6, the spring 20 being under tension, so that when unrestrained it will cause the pad 17 to contact disk 16, thus stopping the motor. The end of the lever 18 distant from the pad 17 has connected thereto the horizontal rod 22, as by pin connection 23. On the under side of rod 22 is a notch 24 with which coöperates the lug 25, which is mounted on the under side of base plate 6, the said abutment and notch coöperating to latch the brake lever 18 in such a position that the pad 17 is out of contact with disk 16, thus allowing the motor to operate.

Secured to or preferably integral with the rod 22 is the vertical trip arm 26, which extends up through a slot 27 in bed plate 6 of the machine. Arm 26 is provided with a cam surface 28, which extends into the path of a member carried by the traveling carriage 8. In the preferred construction, the cam 28 is formed to extend forwardly into the path of some part carried by the carriage, that is, upwardly at an angle and toward the left, referring to Fig. 1. This part on the carriage is most conveniently the pin 29, which is slidably mounted in lugs 30 on the end of the overhanging arm of the traveling carriage 8, this pin being adapted



to form a convenient handle by which the stylus may be lifted from the record, whereupon the end of the pin may be slipped over the top of straight edge 7, forming a means  
 5 for supporting the carriage 8 with the stylus 11 out of contact with the record surface while the record is being changed. It will be noted that the contour of the cam 28 is such as to hold the traveling carriage in position with the arm thereof slidably engaging the top of straight edge 7. It is evident that the same effect might be secured by placing the cam member on the traveling carriage, in which case the cam 28 could be horizontal or nearly so. This expedient  
 10 would be a mere reversal of parts, and I have not deemed it necessary to illustrate the same, it being obvious that such a construction is within the scope of my invention as described, in which the effect of the contact described will be to lift the rod 22 out of contact with the abutment 25, thereby unlatching the rod 22 and allowing spring 20 to force pad 17 into contact with the disk  
 20 16, thus stopping the motor.

Having now described my invention, what I claim and desire to protect by Letters Patent of the United States is as follows:

1. In a phonograph, the combination with  
 30 the governor disk, of a lever carrying a friction pad adapted to coact with said disk to control the same, a longitudinal rod attached to said lever and provided on its under side with a locking notch, an abutment adapted to coact with said notch to hold the rod in such position that the pad is out of contact with the disk, means tending to move said pad into engagement with said disk, a trip arm carried by said rod  
 35 having a cam surface extending upwardly and laterally at an angle to the horizontal, a traveling carriage, and means carried thereby for contacting said cam surface to lift said arm to unlatch said rod, substantially as described.  
 40 45 as described.

2. In a phonograph, the combination with a motor brake of means tending to apply said brake, a longitudinal rod connected to said brake and having a locking notch on its under side, an abutment co-acting with said notch to latch said brake in "off" position, a traveling carriage, a member connected with said rod extending into the path of said carriage, and means carried by said  
 50 carriage to contact said member to lift the same and unlatch said rod at a predetermined point, substantially as described.  
 55 60 said brake, a longitudinal rod connected to

said brake and having a locking notch on its under side, an abutment co-acting with said notch to latch said brake in "off" position, a traveling carriage, a pin carried by said carriage, and a member connected with said rod having a cam extending into the path of said pin, whereby said rod will be lifted out of contact with said abutment at a predetermined point, substantially as described.  
 65 70

4. In a phonograph, the combination with a traveling carriage carrying an arm provided with contacting means, of a motor brake, means tending to apply said brake, a rod pivotally connected to said brake, carrying projecting means adapted to be contacted by said contacting means, and being provided with latching means, an abutment with which said latching means coacts under the influence of gravity to latch said brake in "off" position, and a slideway for said traveling carriage arm, the conformations of said contacting means and projecting means being such that contact therebetween oscillates said rod about its pivot to unlatch the same and presses said arm more tightly upon said slideway, substantially as described.  
 75 80 85

5. In a phonograph, the combination with a motor brake, of means tending to apply said brake, a longitudinally movable rod connected to said brake and having a locking notch on its under side, a stationary abutment coacting with said notch to latch said brake in "off" position, a traveling carriage, a member connected with said rod extending into the path of said carriage, and means carried by said carriage to contact said member to lift the same and unlatch said rod at a predetermined point, substantially as described.  
 90 95 100

6. In a phonograph, the combination with a motor brake, of means tending to apply said brake, a longitudinally movable rod connected to said brake and having a locking notch on its under side, a stationary abutment coacting with said notch to latch said brake in "off" position, a traveling carriage, a pin carried by said carriage, and a member connected with said rod and having a cam extending into the path of said pin, whereby said rod will be lifted out of contact with said abutment at a predetermined point, substantially as described.  
 105 110 115

This specification signed and witnessed this 31st day of March 1909.

PETER WEBER.

Witnesses:

DYER SMITH,  
 JOHN M. CAUFIELD.

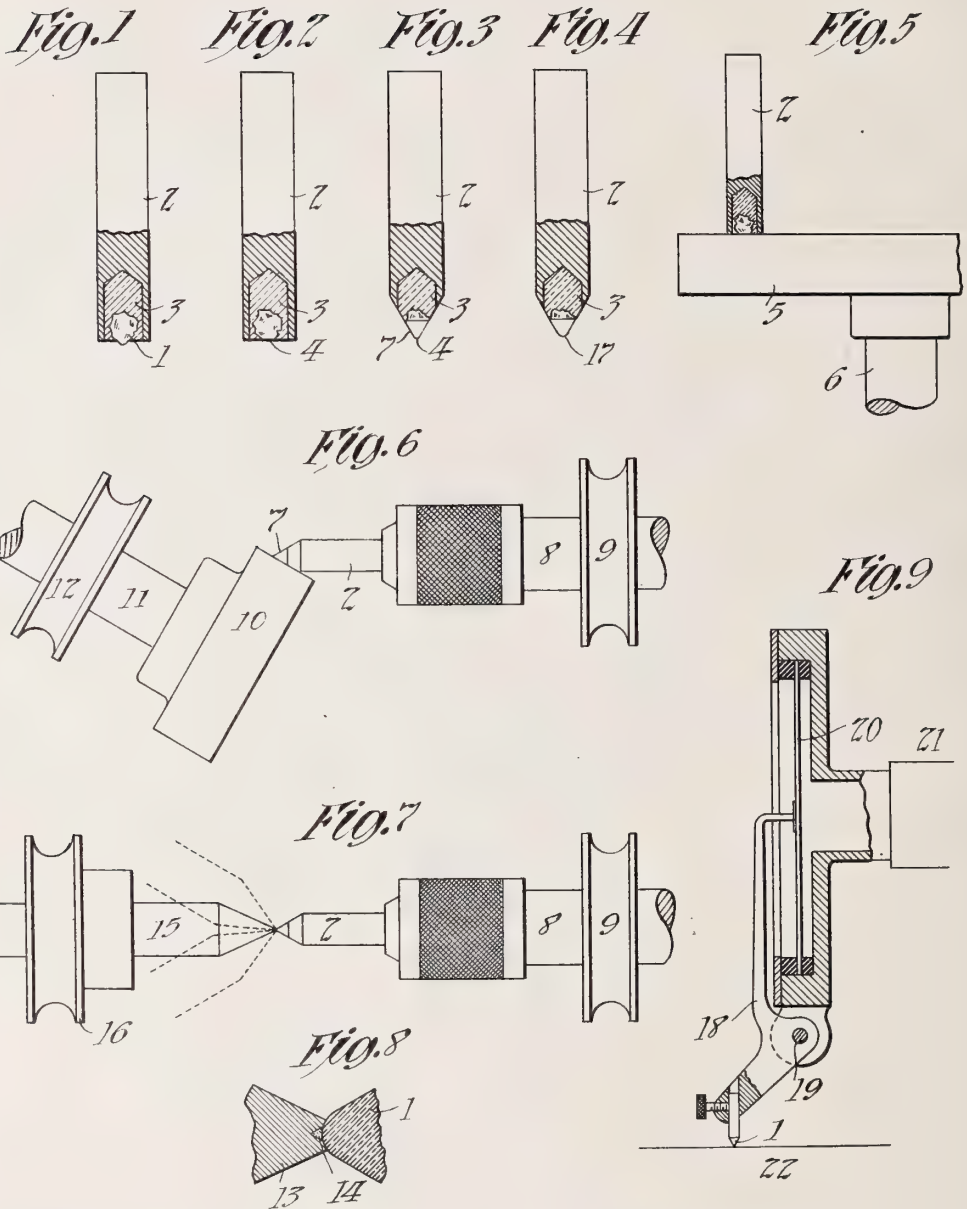




T. A. EDISON.  
 PHONOGRAPH STYLUS.  
 APPLICATION FILED MAY 12, 1910.

1,041,983.

Patented Oct. 22, 1912.



*Witnesses:*

Frank D. Lewis  
 Dyer Smith

*Inventor:*

Thomas A. Edison  
 by Frank L. Ryan  
*his Atty.*

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, WEST ORANGE, NEW JERSEY, ASSIGNOR  
TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A COR-  
PORATION OF NEW JERSEY.

## PHONOGRAPH-STYLUS.

1,041,983.

Specification of Letters Patent.

Patented Oct. 22, 1912.

Application filed May 12, 1910. Serial No. 560,787.

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, West Orange, Essex  
5 county, New Jersey, have invented a certain new and useful Phonograph-Stylus, of which the following is a description.

My invention relates to phonograph styluses.

10 My object is the provision of a reproducing stylus formed of boron, which stylus because of its hardness is capable of operating upon sound records formed from hard materials without wearing away or other-  
15 wise deteriorating.

Crystallized boron is a substance which I have discovered to be well suited for the manufacture of reproducing styluses, since it is of an exceeding hardness, being very  
20 much harder, in fact, than sapphire. I have found that an exceedingly hard record material, such as that disclosed in applications of Aylsworth Serial Nos. 496,060, Plastic composition and process of manu-  
25 facturing the same, filed May 14, 1909; 543,238, Phenolic condensation product and method of preparing same, filed February 11, 1910, and 543,236, Sound records and process for making the same, filed February  
30 11, 1910, wears away the usual sapphire stylus to a considerable extent. Such a record material, or one of equivalent or great hardness, harder, for example, than celluloid, is of the utmost value for the pro-  
35 duction of a molded phonograph record, since with a record formed of such material, a reproducer of considerable weight or provided with a heavy floating weight may be used with a consequent considerable im-  
40 provement in the volume and quality of reproduction, if a stylus of sufficient hardness to withstand the wear caused by the hardness of the record is used therewith. A sap-  
45 phire stylus is not appreciably worn when used in reproducing from such phonograph records, as are now on the market, of which those formed from celluloid are probably the hardest. When, however, the record material is substantially harder than celluloid, a sapphire stylus quickly wears out, and accordingly, I have constructed a stylus of crystallized boron which is adapted to coact with such a record and to withstand the consequent wear.

Boron is now formed in small crystals in  
the electric furnace, which crystals I pro- 55  
pose to utilize in the manufacture of styluses in a manner to be described. In addition to its excessive hardness, boron has the advantages that it can be polished easier  
60 than diamond, and is not so fragile as the latter.

Reference is hereby made to the accompanying drawings forming part of this specification and in which— 65

Figures 1 to 4 inclusive represent side elevations, partly in section, of a holder of brass or other relatively soft material in the end of which a boron crystal is secured, Fig. 1 showing the rough crystal thus secured, Fig. 2 showing the crystal and holder after the lower end thereof has been lapped to a plane surface, Fig. 3 representing the crystal and holder ground or lapped to a taper, and Fig. 4 showing the same with the  
70 blunt end of the taper rounded. Fig. 5 represents diagrammatically in side elevation the process of lapping the flat end upon the crystal and holder. Fig. 6 similarly represents the process of lapping the crystal and  
75 holder to a cone shape, and Fig. 7 similarly represents in plan view the process of rounding the end of the crystal. Fig. 8 is an enlarged sectional detail view showing the method of grinding the rounded surface  
80 upon the end of the boron stylus. Fig. 9 is a partial cross section through a reproducer provided with my improved boron stylus traveling in the record groove of a suitable sound record formed of hard material such  
85 as described above. 90

It will be understood that the process by which my improved stylus is formed may be carried out by various apparatus, and is not limited to the particular mechanism de- 95  
scribed.

Referring to the drawings, my improved stylus is formed from a crystal of boron such as indicated at 1. A small boron crystal of irregular shape is secured within a  
100 holder 2 of brass or other relatively soft material by any suitable means as cement 3. The rough lower edge of crystal 1 is then lapped to a flat surface indicated at 4 in Fig. 2. This operation is indicated  
105 diagrammatically in Fig. 5 in which the lap wheel 5 which rotates about the spindle 6 may be used for producing the plane sur-



face 4 upon crystal 1. The next operation is grinding the sides of the crystal to a taper, resulting in the production of a conical surface 7 upon the lower end of the crystal 1 as indicated in Fig. 3. This operation is indicated diagrammatically in Fig. 6 in which the holder 2 in which the crystal 1 is secured is chucked in a lathe in which the spindle 8 is rotated by means of a belt passing over wheel 9 or by other power connection. While the crystal 1 is being rotated, it, together with the adjacent end of the brass holder in which it is mounted, is ground at a suitable angle, preferably of approximately 30 degrees by means of the lap wheel 10 which is charged with diamond dust and mounted upon shaft 11 which may be adjusted at any suitable angle and rotated by any suitable means indicated diagrammatically by the belt wheel 12. If desired, the two steps of the process so far described may be transposed, and the sides of the crystal adjacent to the end first ground to a taper and the rough end surface remaining then flattened. After the end portion of the crystal has been reduced sufficiently so that the blunt point of flat surface 4 is of sufficiently small area, the latter is rounded and polished by any suitable means, such as the ball polishing machine shown diagrammatically in Fig. 7. As here shown, the crystal 1 secured in a holder 2 is chucked in a lathe having a rotating spindle 8 rotated from belt wheel 9. The end surface 4 of crystal 1 is rounded and polished by means of the grinding tool 13 which is provided with a concave surface of the shape and size to which it is desired to round the end of the stylus. The grinding surface of the tool 13 may be charged with diamond dust mixed with oil, as indicated in Fig. 8 at 14. Either the stylus or the tool grinding the same should partake of an oscillatory movement during the rotation of the stylus.

In the drawings I have illustrated the grinding tool 13 as suitably mounted in a spindle 15 which is revolved by means of belt wheel 16, the spindle and belt being mounted in a holder which is pivoted directly beneath the end of the stylus being rounded, so that during the grinding operation the spindle 15 may oscillate about the surface being ground, as indicated by the position of the spindle 15 shown in dotted lines in Fig. 7. The end of the stylus when rounded is shown in Fig. 4 at 17, the said

figure illustrating the completed stylus which is still secured within holder 2. The curve 17 should be of the proper dimensions to travel within the exceedingly minute sound record groove, the conical surface 7 of the boron crystal preferably running smoothly into the curve 17 of the record engaging surface of the stylus. The stylus thus formed may now be removed from holder 2 and suitably secured in a stylus lever or otherwise mounted to reproduce from a sound record.

In Fig. 9 I have illustrated a stylus 1 connected by lever 18 pivoted at 19 to diaphragm 20 of reproducer 21. The boron stylus may be secured directly in the stylus lever or it may be mounted within a suitable holder which is secured in the end of the stylus lever as shown. The reproducer 21 illustrated is preferably of considerable weight as, for example, from 3 to 5 ounces or more, which weight holds stylus 1 firmly in engagement with the record groove of record 22 which is preferably formed of the hard record material above referred to.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. As a new article of manufacture, a stylus for talking machines formed of crystallized boron, substantially as described.
2. As a new article of manufacture, a stylus for talking machines formed of a substance containing crystallized boron, substantially as described.
3. As a new article of manufacture, a boron stylus having a conical end with rounded point adapted to travel in the groove of a sound record, substantially as described.
4. As a new article of manufacture, a boron stylus having irregular contour and a lapped tapered end with rounded point adapted to travel in the groove of a sound record, substantially as described.
5. As an article of manufacture, a boron stylus having irregular contour and a tapered end with a rounded point adapted to travel in the groove of a sound record, substantially as described.

This specification signed and witnessed this 2d day of May 1910.

THOS. A. EDISON.

Witnesses:

FRANK L. DYER,  
DYER SMITH.



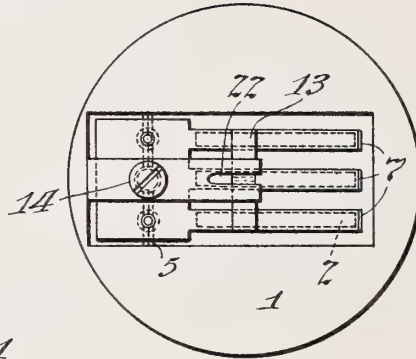


A. N. PIERMAN.  
SOUND REPRODUCING APPARATUS.  
APPLICATION FILED JULY 18, 1907.

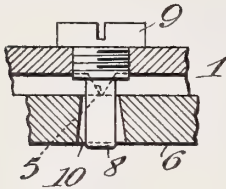
1,042,034.

Patented Oct. 22, 1912.

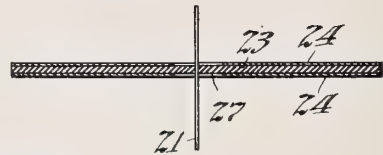
*Fig. 1*



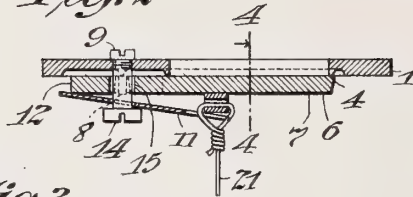
*Fig. 5*



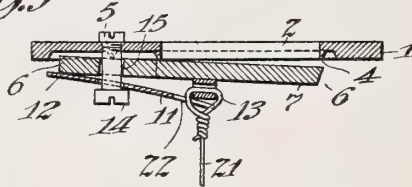
*Fig. 7*



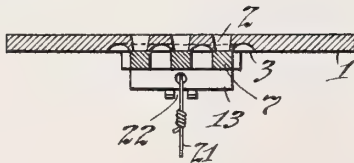
*Fig. 2*



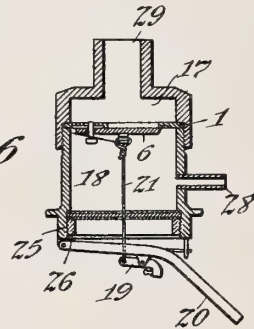
*Fig. 3*



*Fig. 4*



*Fig. 6*



*Witnesses:*  
Frank D. Lewis  
H. H. Dyke

*Inventor:*  
Alexander N. Pierman  
by Frank L. Roper  
Atty.

# UNITED STATES PATENT OFFICE.

ALEXANDER N. PIERMAN, OF NEWARK, NEW JERSEY, ASSIGNOR. BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## SOUND-REPRODUCING APPARATUS.

1,042,034.

Specification of Letters Patent.

Patented Oct. 22, 1912.

Application filed July 18, 1907. Serial No. 384,328.

*To all whom it may concern.*

Be it known that I, ALEXANDER N. PIERMAN, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Sound-Reproducing Apparatus, of which the following is a description.

My invention relates to sound reproducers which operate by varying the rate of flow of an elastic fluid through valve governed ports.

The present invention is directed to the improvement of the valve and the parts immediately coöperating therewith, and to the improvement of the means for preventing the admission of air into the reproducer past the valve operating means.

In order that the invention may be better understood, attention is directed to the accompanying drawings wherein the same reference characters are used uniformly to designate the same parts and in which—

Figure 1 is a bottom plan view of the ported plate and the valve; Figs. 2 and 3 are vertical central cross-sectional views of the same, showing the valve in closed and open positions respectively; Fig. 4 is a cross-sectional view on the line 4—4, Fig. 2; Fig. 5 is a detail of the valve positioning means; Fig. 6 is a vertical cross-sectional view of a reproducer fitted with my improved valve and port plate and air excluding means, and Fig. 7 is a detail cross-sectional view of the said air excluding means.

The port plate 1 is provided with a number of ports 2, preferably having downwardly converging walls, as shown in Fig. 4. These ports are preferably situated slightly at one side of the center of the port plate, as shown in Fig. 1, in order that the valve as a whole may be placed substantially centrally thereof. At the sides of these slots or ports, the material of the port plate, which is preferably of metal, is cut away as shown at 3, thus leaving only the knife edges 4 for the air to pass over and preventing any cushioning of the valve. At that end of the ports where the greater portion of the port plate is left, the material of the port-plate is cut away, not only immediately adjacent the ports but to a considerable distance therefrom, leaving only the knife edge 5 for the valve plate to turn on. Manifestly this knife edge 5 may be formed of the

metal of the port plate or a specially hardened piece may be inserted as desired. The considerable cutting away of the port plate just referred to provides room to accommodate the movement of the valve.

The valve plate 6 is provided with as many tongues 7 as there are ports 2. I have obtained good results with the use of three ports and tongues, which is the number shown in the drawings. My invention, however, is not limited as to the number of ports of which I may make use. This valve 6 is preferably formed of a light metal, such as aluminum, although, of course, other materials may be used. At each side of the valve plate and in the same line with the knife-edge 5, I provide positioning means for properly positioning the valve tongues with respect to the ports. The positioning means which I have shown consists of studs 8 formed on screws 9 by which they are secured in the port plate, and fitting loosely into the openings 10 in the valve plate. These openings are preferably made slightly larger on the side of the valve plate farthest from the port plate, but this, of course, need not be done unless desired. The valve plate is held resiliently against the port plate by means of a spring 11 which bears against one end 12 of the valve plate and against the cross-bar 13 which connects the tongues 7 and is situated at substantially the middle of the valve plate. This spring is supported between its ends by a screw 14 which is passed loosely through an opening 15 in the valve plate and is threaded into the port plate. The screw 14, like the studs 8, has its axis in the same line with the knife edge 5, and the pressure of the spring 11 upon the valve may be controlled by adjusting this screw.

The port plate and valve just described are placed between the resonating chamber 17 and the equalizing chamber 18, of a reproducer of the type above mentioned, and the valve plate is connected to the stylus lever 19 which is pivoted to the floating weight 20 by a link 21 which is preferably secured to the cross-bar 13, the spring 11 being preferably bifurcated as shown at 22, to permit the link to be secured to the said cross-bar at its center.

I have devised an improved form of closure for the lower end of the equalizing chamber 18, through which the link 21



passes, this closure comprising a piece 23 of soft, flexible material, such as rubber, interposed between the two plates 24 of stiffer material, such as metal or celluloid, and which are secured within the annular recess 25 in the reproducer by a screw ring 26. Openings 27 of relatively large area are provided in these plates 24, so that the link 21 may work freely therein, and the opening in the rubber piece 23 is made just large enough to admit the link 21. This opening may be conveniently made with a needle. This construction allows the link 21 the requisite play necessary to the proper operation of the device, and effectually prevents the passage of air around the link 21.

The operation of my improved device is as follows: An elastic fluid, preferably air, is drawn into the reproducer by means of a suction device attached to the nipple 28 connected with the equalizing chamber 18, and enters into the resonating chamber 17 through an opening 29 to which a horn may be attached. The valve plate 6 is rapidly vibrated by the stylus which follows the record grooves in the sound record, and the variation in the rate of flow of fluid through the ports 2, produced thereby, throws the column of air in the resonating chamber and the horn into vibration, and by this means the sounds which have been recorded are reproduced with great fullness and purity.

Having now described my invention, what I claim is:

1. In an elastic fluid sound reproducing apparatus, the combination of a valve seat provided with ports, a knife edge, a valve adapted to turn on the knife edge, means in line with the knife edge for positioning the valve on the seat, a cross-bar on the said valve, a spring bearing against the valve and against said cross-bar, and an adjusting screw in line with the knife edge for pressing said spring against the valve, substantially as set forth.

2. In an elastic fluid sound reproducing apparatus, the combination of a valve seat provided with ports, a valve cooperating therewith, a cross-bar on the said valve, a spring bearing adjacent to its ends against said valve and cross-bar, means for pressing the spring against the valve and means for actuating the valve connected with the said cross-bar, substantially as set forth.

3. In an elastic fluid sound reproducing apparatus, the combination of a valve seat provided with ports, a valve cooperating therewith, a cross bar on said valve, actuating means for the valve connected to the said cross-bar, a spring bearing against the said valve and cross-bar, the said spring being bifurcated to permit the connection of

the actuating means to the cross-bar between its forks, and means for pressing the spring against the valve, substantially as set forth.

4. A sound reproducer comprising in combination a resonating chamber and an equalizing chamber, a ported valve seated between the chambers and provided with a knife edge, a valve adapted to turn on said knife edge, means for resiliently holding the valve to its seat and actuating means for said valve comprising a stylus, a stylus lever, a floating weight to which the stylus lever is pivoted and a connection between said stylus lever and valve, substantially as set forth.

5. A closure for an equalizing chamber of an elastic fluid sound reproducing apparatus, comprising a piece of soft rubber perforated for the passage of the valve operating link, plates of stiffer material between which the rubber piece is interposed, and means for securing the same in place, substantially as set forth.

6. In an elastic fluid sound reproducing apparatus provided with an equalizing chamber, a valve seat, a valve operating link extending through said chamber, and a closure for said chamber comprising a piece of soft rubber perforated for the passage of the valve operating link, plates of stiffer material provided with openings of relatively large area and between which the rubber piece is interposed, and means for securing the same in place, substantially as set forth.

7. In an elastic fluid sound reproducing apparatus, the combination of a valve seat provided with ports, a valve comprising a plurality of tongues cooperating therewith, resilient means for holding the valve to its seat, a cross bar on said valve connecting said tongues and positioned intermediate the edges of said valve and means connected with said cross bar for actuating the said valve, substantially as set forth.

8. In an elastic fluid sound reproducing apparatus provided with an equalizing chamber, a valve, a valve operating link extending through said chamber, and a closure for said chamber, comprising a piece of soft material perforated for the passage of the said link, plates of stiffer material between which the soft material is interposed, and means for securing the same in place, substantially as set forth.

This specification signed and witnessed this 16th day of July 1907.

ALEXANDER N. PIERMAN.

Witnesses:

FRANK D. LEWIS,  
CHARLES F. ROBSON.



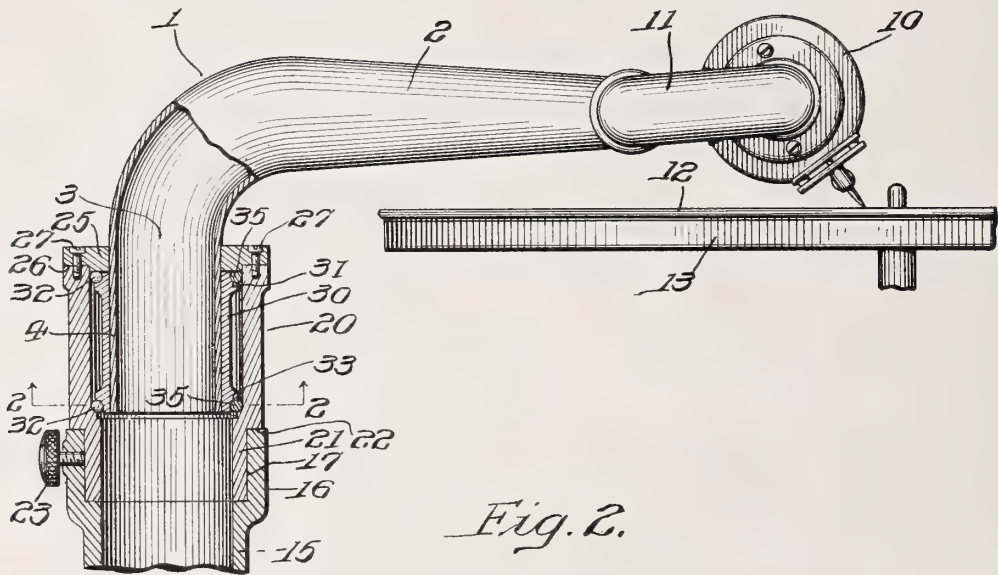


J. C. ENGLISH.  
TALKING MACHINE.  
APPLICATION FILED JULY 29, 1911.

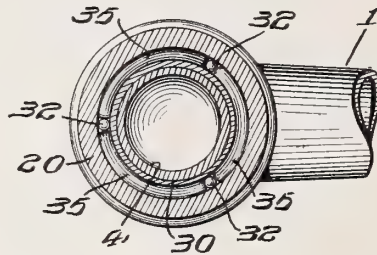
1,042,098.

Patented Oct. 22, 1912.

*Fig. 1.*



*Fig. 2.*



INVENTOR  
*John C. English.*

WITNESSES  
*W. J. Hartman.*  
*A. J. Gardner.*

BY

*Wm. V. Kelly.*

ATTORNEY

# UNITED STATES PATENT OFFICE.

JOHN C. ENGLISH, OF CAMDEN, NEW JERSEY, ASSIGNOR TO VICTOR TALKING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

## TALKING-MACHINE.

1,042,098.

Specification of Letters Patent.

Patented Oct. 22, 1912.

Original application filed May 29, 1909. Serial No. 499,080. Divided and this application filed July 29, 1911. Serial No. 641,250.

### *To all whom it may concern:*

Be it known that I, JOHN C. ENGLISH, a citizen of the United States, and a resident of the city of Camden, county of Camden, and State of New Jersey, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification, this application being a division of my application, Serial No. 499,080, filed May 29, 1909.

The main objects of this invention are to provide in a talking machine, an improved combined sound box, and tone arm and mounting therefor; to provide an improved anti-friction mounting for a tone arm or sound box arm, and to provide other improvements as will appear hereinafter.

In the accompanying drawings, Figure 1 is a fragmentary side elevation of a talking machine partially in vertical central section, showing one embodiment of this invention; and Fig. 2 a horizontal section on line 2-2 of Fig. 1 looking in the direction of the arrows.

Referring to the drawings, one embodiment of this invention comprises a hollow tapering tone arm or sound box arm 1, the smaller end 2 of which preferably projects substantially horizontally and the larger end of which is turned downwardly through an arc of 90 degrees and terminates in a substantially vertical cylindrical portion 3.

Connected to the smaller end of the tone arm 1 in any well known or suitable manner so as to communicate therewith and be movable upwardly and downwardly with respect thereto is a sound box 10 of any well known or suitable construction. In this instance the sound box 10 is connected to the smaller end 2 of the tone arm in a well known manner by means of a longitudinally curved tube 11, one end of which is pivotally connected to the smaller end of the tone arm and the other end of which is connected to the sound box. The sound box 10 is arranged to cooperate with the usual sound record 12 mounted upon the usual turntable 13.

For rotatably supporting the sound box arm 1 so that its smaller horizontal end 2 will be restrained to swing in a fixed horizontal plane, there is provided beneath and

in axial alinement with the larger end 4 of the sound box arm, a downwardly extending hollow bracket or support 15 which is fixed in position by being rigidly secured to the usual cabinet (not shown) of the talking machine, or to any other fixed support. The upper end of the hollow bracket 15 is substantially cylindrical in shape and is enlarged externally as at 16 and provided internally with an annular cylindrical recess extending from the top of the bracket a short distance downwardly into the enlarged end of the bracket, forming a vertical socket 17.

Telescoping in the socket 17 of the hollow support 15 is a substantially cylindrical and vertical hollow head or casing 20, the lower end of the head being reduced in diameter externally, or provided with an external annular recess, to form a cylindrical neck 21 which fits snugly but removably into the recess 17 of the bracket 15. Between the neck 21 of the casing 20 and the upper portion thereof, there is thus formed an annular external shoulder 22 which rests upon the upper end of the bracket 16 when the casing is in operative position in the bracket. The casing 20 is held in a fixed position in the bracket 15 by means of a thumb-screw 23 threaded through the upper portion of the bracket and engaging against the neck 21 of the casing, and the casing may be readily removed from the bracket when the screw is loosened.

The upper end of the casing 20 surrounds and is spaced from the lower or larger end 4 of the tone arm 1, and is closed by an annular cover 25 in which the larger end 4 of the tone arm fits snugly but rotatively. The under side of the cover 25 is provided with an annular peripheral recess 26 in which the upper end of the casing 20 fits snugly, and the cover is held rigidly in place upon the casing 20 by screws 27 extending through the covers and threaded into the casing. The portion of the sound box arm within the casing 20 is surrounded by a sleeve 30 within the casing and rigidly secured to the arm by any suitable means, the sleeve preferably fitting tightly around the arm.

The sleeve 30 is preferably enlarged at each end and is provided at each end with



an annular external groove coaxial therewith to form annular bearings 31 for anti-friction balls 32. The interior of the casing 20 is enlarged to receive the sleeve 30 and to form an annular bearing 33 opposite the lower annular bearing 31 of the sleeve, the interior diameter of the enlarged portion of the casing being somewhat greater than the outside diameter of the sleeve to permit of the free rotary movement of the sleeve.

The balls 32 surrounding the upper end of the sleeve rest in an annular raceway formed by the annular bearing 31 upon the upper end of the sleeve and annular bearings formed by the inner portion of the upper end of the casing and the adjacent inner portion of the cover 25, and the balls 32 surrounding the lower end of the sleeve rest in an annular raceway formed between the annular bearing 31 on the lower end of the sleeve 30 and the corresponding annular bearing 33 formed in the casing.

Preferably but three balls 32 are used in each annular raceway between the sleeve 30 and the casing 20, thus forming a three point support in each raceway for the tone arm. The three balls in each raceway are preferably equi-spaced, each ball being separated from each adjacent ball by means of a segmental space bar 35, preferably round in cross section, which fits loosely in the raceway.

From the foregoing description, it is evident that this invention provides a simple and durable anti-friction mounting for a tone arm by which the tone arm will be restrained to rotate or oscillate freely about a fixed axis. By providing the larger end of the tone arm with spaced annular bearings or raceways, each containing a set of three balls, the larger end of the tone arm is held against lateral or longitudinal movement and the smaller or free end 2 of the tone arm is restrained to rotate or oscillate smoothly and freely in a horizontal plane about an axis coincident with the longitudinal vertical axis of the larger end of the tone arm. By thus mounting the tone arm, a maximum efficiency of the sound box is obtained.

Although only a single form has been illustrated herein in which this invention may be embodied, the invention is not limited to any particular construction but may be varied to meet various conditions without departing from the spirit of this invention or the scope of the appended claims.

Having thus described my invention, I claim and desire to protect by Letters Patent of the United States:—

1. The combination with a hollow bracket, of a hollow head detachably connected to said bracket and communicating therewith, a radial sound box arm rotatably engaging

in said head, a sleeve surrounding and fixed upon said arm in said head, and rotary antifriction means between said sleeve and said head.

2. The combination with a hollow bracket, of a hollow head detachably connected to said bracket and communicating therewith, a radial sound box arm rotatably engaging in said head, a sleeve surrounding and fixed upon said arm in said head, and ball bearings between said sleeve and said head.

3. The combination with a hollow head, of a radial sound box arm engaging in said hollow head, a sleeve surrounding said arm and fixed thereon in said head, said sleeve being provided with annular recesses and rotary antifriction means in said recesses, between said sleeve and said head.

4. The combination with a fixed hollow bracket having one end enlarged and provided with an internal annular recess, of a hollow head detachably fixed in said recess, a radial sound box arm engaging in said hollow head, a sleeve surrounding said arm and fixed thereon in said head, said sleeve being provided with annular recesses, and balls in said recesses between said sleeve and said head.

5. The combination with a hollow head of an annular cover removably connected to said head, a radial sound box arm projecting through said cover and into said head, a sleeve surrounding and fixed on said arm in said head and having annular grooves forming bearings, one of said grooves being adjacent the inner surface of said cover, and balls in said grooves contacting with said sleeve and with said head.

6. The combination with a hollow bracket, of a hollow head detachably fixed thereon and communicating therewith, an annular cover removably connected to said head, a radial sound box arm projecting through said cover and into said head, a sleeve surrounding and fixed on said arm in said head and having annular grooves forming bearings, one of said grooves being adjacent the inner surface of said cover, and balls in said grooves contacting with said sleeve and with said head.

7. The combination with a hollow head of an annular cover removably connected to said head, a radial sound box arm projecting through said cover and into said head, a sleeve surrounding and fixed on said arm in said head and having annular grooves forming bearings, one of said grooves being adjacent the inner surface of said cover, and balls in said grooves contacting with said sleeve and with said head and its cover, said head being enlarged internally to receive said sleeve and said balls.

8. The combination with a hollow bracket of a hollow head detachably fixed thereon and communicating therewith, an annular

cover removably connected to said head, a radial sound box arm projecting through said cover and into said head, a sleeve surrounding and fixed on said arm in said head  
 5 and having annular grooves forming bearings, one of said grooves being adjacent the inner surface of said cover, and balls in said grooves contacting with said sleeve and with said head and its cover, said head being enlarged internally to receive said sleeve and  
 10 said balls.

9. The combination with a sound box arm, of a sleeve on one end of said arm, having annular grooves in the opposite ends  
 15 thereof, supporting members in said grooves, and segmental spacing members between said supporting members.

10. The combination with a sound box arm, of a sleeve on one end of said arm, having annular grooves in the opposite ends  
 20 thereof, equally spaced supporting members in said grooves, and segmental spacing members between said supporting members.

11. The combination with a sound box arm, of a sleeve on one end of said arm, having annular grooves in the opposite ends  
 25 thereof, equally spaced rotary supporting members in said grooves, and segmental spacing members between said rotary supporting members.  
 30

12. The combination with a sound box arm, of a sleeve on one end of said arm, having annular grooves in the opposite ends  
 thereof, equally spaced rotary supporting members in said grooves, and segmental  
 35 spacing members between said rotary supporting members, the rotary members in the respective grooves acting in opposite direc-

tions longitudinally of said sound box arm to form a double thrust-bearing. 40

13. The combination with a sound box arm, of a sleeve on one end of said arm having annular grooves in the opposite ends thereof, three equi-spaced rotary supporting  
 45 members in each of said grooves, and segmental spacing members between said rotary supporting members.

14. The combination with a sound box arm, of a sleeve on one end of said arm having annular grooves in the opposite ends  
 50 thereof, three equi-spaced supporting members in each of said grooves, and segmental spacing members between said supporting members.

15. The combination with a hollow  
 55 bracket, of a hollow head detachably connected to said bracket and communicating therewith, a radial sound box arm rotatably engaging in said head, a sleeve surrounding and fixed upon said arm in said head, and  
 60 equi-spaced rotary anti-friction means between said sleeve and said head.

16. The combination with a hollow bracket, of a hollow head detachably connected to said bracket and communicating  
 65 therewith, a radial sound box arm rotatably engaging in said head, a sleeve surrounding and fixed upon said arm in said head, and equi-spaced ball bearings between said sleeve and said head. 70

In witness whereof I have hereunto fixed my hand this 27th day of July, A. D. 1911.

JOHN C. ENGLISH.

Witnesses:

FRANK B. MIDDLETON, Jr.,

CHARLES F. WILLARD.





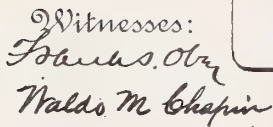


PHONOGRAPH.

Patented Oct. 22, 1912.

3 SHEETS—SHEET 1.

*Fig. 1.*



Inventor  
John H. J. Haines  
By his Attorneys  
Rosenbaum & Stockbridge





J. H. J. HAINES.

PHONOGRAPH.

APPLICATION FILED NOV. 16, 1908.

Patented Oct. 22, 1912.

3 SHEETS-SHEET 3.

1,042,110.

Fig. 4.

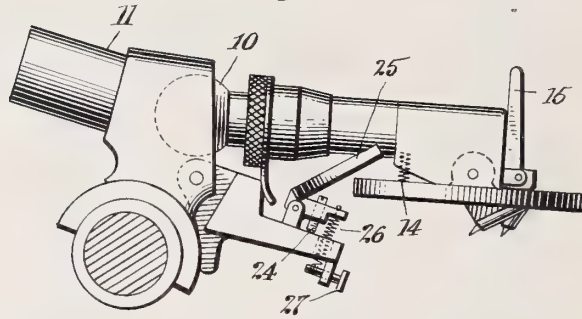


Fig. 5.

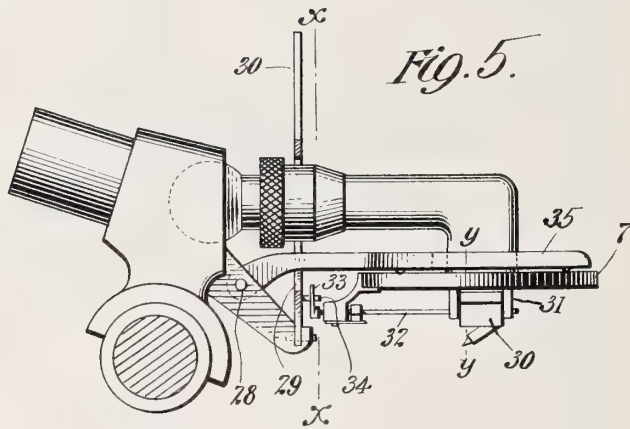


Fig. 6.

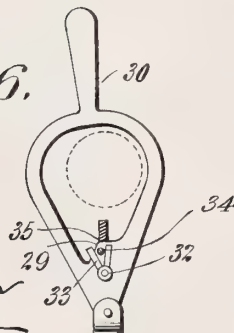
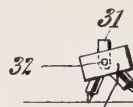


Fig. 7.



Witnesses:

*Franz Ober*  
*Waldo M. Chapin*

Inventor  
*John H. J. Haines*  
By *Attorneys*  
*Rosenbaum & Stockenage*



J. H. J. HAINES.

PHONOGRAPH.

APPLICATION FILED NOV. 16, 1908.

1,042,110.

Patented Oct. 22, 1912.

3 SHEETS-SHEET 2.

Fig. 2.

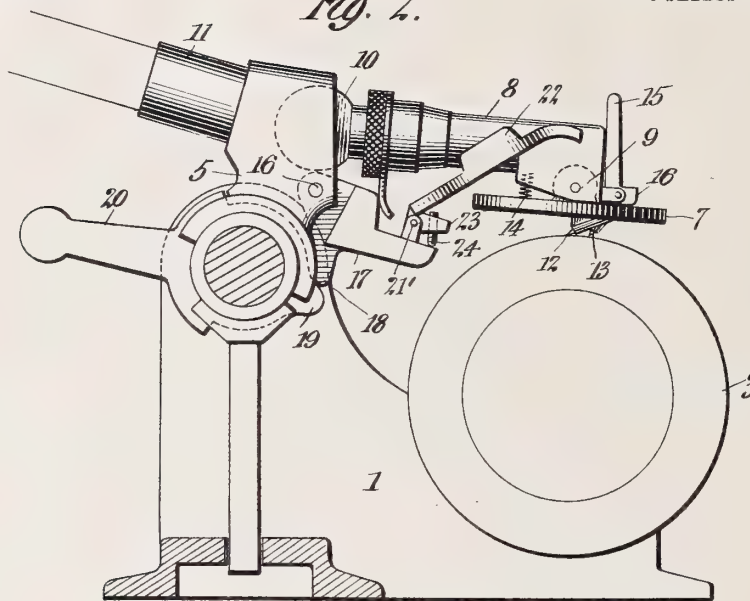
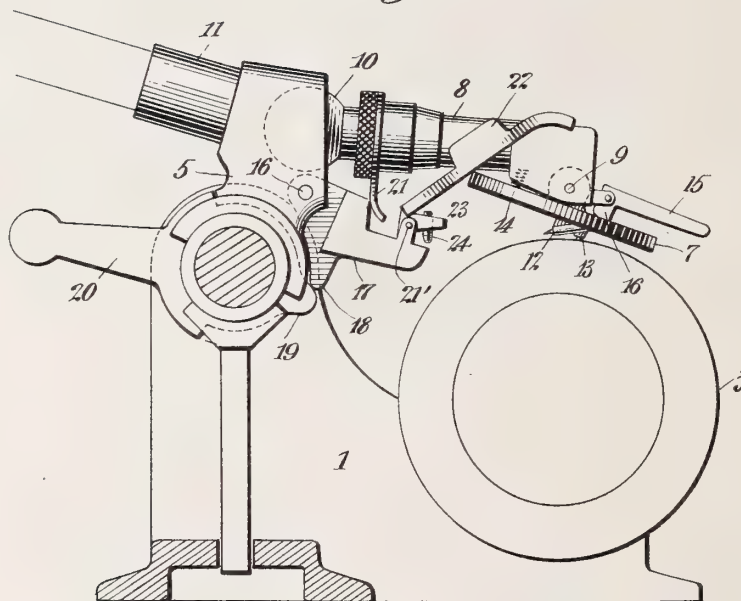


Fig. 3.



Witnesses:  
Charles Ober  
Waldo M. Chapin

Inventor  
John H. J. Haines  
By Rosenbaum & Stockmayer  
Attorneys

# UNITED STATES PATENT OFFICE.

JOHN H. J. HAINES, OF NEW YORK, N. Y.

PHONOGRAPH.

1,042,110.

Specification of Letters Patent.

Patented Oct. 22, 1912.

Application filed November 16, 1908. Serial No. 462,783.

*To all whom it may concern:*

Be it known that I, JOHN H. J. HAINES, a citizen of the United States, residing at the city of New York, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Phonographs, of which the following is a full, clear, and exact description.

This invention relates to phonographs and other styles of talking machines in which the record is traced in a tablet in the form of a groove varying in depth in accordance with the vibrations of the sounds recorded and to be reproduced. In this type of talking machine it has been customary to employ one device for recording sounds and another for reproducing them. These devices each comprise essentially a diaphragm mounted in a sound box and carrying a stylus which engages the surface of the record tablet. In the recorder the stylus is caused to cut a groove of varying depth in the recording surface, while in the reproducer the stylus, which is of slightly different construction, is adapted to traverse the groove formed by the recorder and to transfer the undulations of the groove successively to the diaphragm. An essential difference in these two devices is that the reproducer when in action rests more heavily against the record surface than does the recorder. The reason for this is that in recording, the instrument should be in a nearly floating condition with its stylus located so as to just cut the record surface and its movements not be interfered with by the inertia of the frame in which the diaphragm is supported. In other words it must be as sensitive as possible to sound vibration. In the reproducer, on the contrary, the device would not act properly if it were in a floating condition because the irregularities of the record groove which are driven against the stylus by the rotating tablet would cause the stylus to jump or "stutter" and give imperfect reproduction. Therefore in the reproducer it is the common practice to add weight to the frame on which the diaphragm and stylus are supported, so as to hold the stylus to its work in the groove. Hence, aside from the difference in the form of the stylus points, the essential difference between a recorder and a reproducer is that the latter is heavier than the former.

Heretofore and prior to my invention it has been customary, where the talking ma-

chine is intended for both recording and reproducing, to provide the machine with two separate and distinct devices, one to be used for the recording, and this to be removed and replaced by the other, for reproducing.

It is the object of my invention to provide in one and the same instrument, both the recording and reproducing devices, and in so doing to utilize a single head which comprises a diaphragm, sound box and frame. I accomplish this by providing a weight or spring so arranged that when the head is in a position to record, it will be independent of and uninfluenced by the weight or spring, but when the head is thrown into a position to reproduce, the weight or spring is automatically brought to bear upon it so as to afford the necessary additional pressure against the record surface required in the reproducing operation.

To be more specific, my invention consists of a recorder-reproducer comprehending a single diaphragm having attached thereto a recording and a reproducing stylus, means for bringing into active position either one of the styluses at will, and means whereby a weight or the force of a spring will be added to or removed from the instrument accordingly as the reproducing or the recording styluses are thrown into action. My invention thus very much simplifies the operation of talking machines as well as reduces their cost and the time ordinarily required to shift from the recording to the reproducing device is almost entirely saved.

My invention will be now described with reference to the accompanying drawings, in which:

Figure 1 is a plan of a portion of the frame of a phonograph, showing my combined recorder and reproducer in operative position thereon and utilizing a weight instead of a spring; Fig. 2 is an end elevation of the same machine with the recorder-reproducer adjusted for the recording operation; Fig. 3 is a view similar to Fig. 2 with the recorder-reproducer adjusted for the reproducing operation; Fig. 4 is a view showing the device in condition for recording, but with a spring substituted for the weight; Fig. 5 illustrates a modification in the construction of the weight in connection with a modification of the manner of shifting the stylus points; Fig. 6 is a section on line X—X of Fig. 5; and Fig. 7 is a section on line Y—Y of Fig. 5.



Referring to the drawings by numerals, 1 indicates the frame of the phonograph in which is mounted the tapering cylinder 2 which supports the record tablet in the form of a cylinder and indicated by 3.

4 is a rod along which the carriage 5 travels.

The recorder-reproducer consists of a sound box or frame 7 in which is mounted the diaphragm, and a tubular arm 8 to which the sound box is pivoted at 9 and which communicates with the interior chamber thereof above the diaphragm. The arm 8 is connected by means of a universal joint 10 with the carriage 5 and the latter is provided with a nipple 11 to receive the end of a flexible tube and through which a passage leads into the arm 8, thus forming a continuous sound passage from the upper side of the diaphragm to and through the flexible tube, the outer end of which is to be attached as usual to the mouth piece or horn.

At or near the center of the diaphragm are fixed two stylus points 12 and 13, the point 12 being for recording and the point 13 for reproducing. The sound box 7 on one side of its pivot 9 is subjected to the pressure of a spring 14 which tends to hold it in a horizontal position, as shown in Fig. 2, the end of arm 8 on one side of the pivot 9 serving as a stop.

15 is a lever pivoted to the end of arm 8 and having an eccentric lug 16 which is adapted, in one position of the lever, to bear against and tilt the sound box 7 into an oblique position, as shown in Fig. 3, while when the lever is thrown upward into its other position as in Fig. 2, the sound box is permitted to return to a horizontal position under the action of and be held by, the spring 14. When the sound box is in the horizontal position, the recording stylus 12 is in position to engage the record surface of the tablet 3, as seen in Fig. 2, and when the sound box is in the oblique position, the stylus 12 is thrown out of contact with the record surface and the stylus 13 is thrown into operative position therewith.

Pivotaly attached to the carriage 5 at the point 16 is a bracket 17 provided with a lug 18 adapted to be engaged by another lug 19 which is manipulated by a hand lever 20 to raise and lower the instrument. The instrument for the purpose, is provided with a tongue 21 which bears against a shoulder on the bracket 17 as shown, so that when the bracket is swung upward, the instrument is raised and can be moved along the rod 4 to any desired position and when the bracket is lowered, it will drop into engagement with the record tablet. This device for raising and lowering the instrument is an ordinary one and forms no part of my present invention. Preferably attached to

this bracket 17, however, by means of a pivot 21' is a weighted lever 22, being a bifurcated plate embracing the opposite sides of the tubular arm 8. This lever has a projection 23 carrying a set screw 24 which may be adjusted to determine the elevation of the lever when supported at its lowest point. The weighted lever extends over the inner edge of the sound box 7 and the screw 24 is so adjusted that when the sound box is in the horizontal position shown in Fig. 2, the weight is supported wholly by the bracket 17 and is entirely clear and independent of the sound box or speaker, but when the sound box 7 is tilted to the oblique position shown in Fig. 3, the inner edge of the sound box strikes and lifts slightly the weight so that the latter rests upon or is sustained by the sound box.

The operation is as follows: When the instrument is used as a recorder, the lever 15 is raised to the vertical position, as shown in Fig. 2, and the sound box allowed to assume its horizontal position, thus bringing the recording stylus 12 into active position and relieving the instrument of the weight 22. The record is then made in the usual way by transmitting the voice or other sounds through the tube to the top of the diaphragm. When the record has thus been made, if and when it is desired to reproduce, the lever 15 is thrown downward to the position shown in Fig. 3 which removes the recording stylus 12 and simultaneously throws into active position the reproducing stylus 13. At the same time the forward upper edge of frame 7 strikes and lifts the lever 22 thus transferring its weight from the bracket 17 or other part of the frame to which it may be attached, to the sound box frame. This weight which is thus added to the instrument is of the proper amount to afford the additional stability or inertia required for the proper action of the reproducer and thus affords a reproduction as faithful and clear as if the reproducing instrument were entirely independent and distinct from the recording instrument.

It will be observed that in changing from the recorder to the reproducer, it is not necessary to remove and replace any of the parts, but that it merely requires the operator to shift the position of lever 15. The cost of this combined device is only a trifle more than that of either the recorder or reproducer alone and no skill is required to make the change from one to the other.

The construction of Fig. 4 is the equivalent in every sense of that of Figs. 1 to 3, since a spring is used instead of its equivalent, the weight. In this construction the weight becomes a mere lever 25, having the same stop screw 24, but provided with a tension spring 26 which tends to throw the lever 25 downward with a force dependent upon the

adjustment of screw 27. Thus when the sound box 7 is tilted, it lifts the lever 25 and is subjected to the tension of the spring 26 which is the equivalent of the weight 22.

5 In Fig. 5 the sound box 7 remains horizontal at all times. The weight 35 is bifurcated as before and adapted to be lowered upon, or supported above and independently of, the sound box; it is pivoted to the carriage at 28 and rests upon a lug 29 carried by a pivoted lever 30, which lever is to be manipulated by hand. The stylus points radiate from a hub 30 which is pivoted to brackets 31 attached to the diaphragm. The hub is fixed upon a rock-shaft 32 which also carries a fork 33 between the legs of which is a pin 34 carried by lever 30. When lever 30 is swung to one side or the other, the styluses are shifted and the weight 35 is raised or lowered by the lug 29, thus either lifting the weight from or adding it to the instrument.

The essential feature of my invention therefore is any structure comprising the elements common to a recorder and a reproducer in combination with a weight or its equivalent adapted to be added thereto or removed therefrom according to the requirements of the operation.

30 What I claim, is:

1. In a phonograph or similar talking machine, a combined recording and reproducing head in combination with a weight adapted to be shifted to and from the same, according as to whether it is to be used as a reproducer or recorder, substantially as described.

2. In a recording and reproducing machine, an instrument comprising a single diaphragm and two stylus points, one for recording and the other for reproducing, in combination with a weight independently mounted with respect to the diaphragm and styli, and means for adding the weight to the diaphragm for the reproducing operation and for removing it from the diaphragm for the recording operation, substantially as described.

3. In a phonograph or similar talking machine, an instrument comprising a single diaphragm and two stylus points, one for recording and the other for reproducing, in combination with a weight independently mounted with respect to the diaphragm and styli, and means for simultaneously throwing one stylus point into operative position and the other out of operative position and adding the weight to or removing it from the diaphragm.

4. In a phonograph or similar talking machine, a recorder-reproducer head combined with an independent weight and means whereby the weight may be applied to or removed from the recorder-reproducer head, for the purpose set forth.

5. In a phonograph or similar talking machine, a recorder-reproducer head comprising two stylus points and means for adjusting said points into and out of operative position, in combination with a weight mounted independently of the recorder-reproducer head, and means whereby the weight is automatically applied to the recorder-reproducer head when one of the styli is adjusted to operative position, substantially as described.

6. In a phonograph or similar talking machine, a recorder-reproducer head and a weight supported by the frame of the machine independent of the recorder-reproducer head, and means whereby the weight can be shifted to the recorder-reproducer head.

7. In a phonograph or similar talking machine, the combination of a carriage, a recorder-reproducer head and a weight supported by said carriage independently of said head but adapted to be transferred to the recorder-reproducer head.

8. In a sound recording and reproducing machine, a diaphragm and styli adapted either for recording or reproducing in combination with pressure means mounted independently of the diaphragm and styli adapted to be shifted to and from said diaphragm and styli according as to whether they are to be used as a reproducer or recorder, substantially as described.

9. In a sound recording and reproducing machine, a main frame, a sound-box and diaphragm carried thereby and tiltable with respect to the frame and adapted to act either as a recorder or a reproducer, in combination with a pressure device supported by the frame, and means whereby said pressure device may be operatively connected at will with the sound-box and diaphragm, for the purpose set forth.

10. In a sound recording and reproducing machine, a sound-box carrying a diaphragm, the latter having recording and reproducing styli rigidly fixed thereto in combination with a weight, said sound-box and weight being pivotally mounted on independent axes and means whereby the weight may be brought to bear upon the sound box by a relative movement of said parts upon their axes.

11. A sound recording and reproducing machine, comprising a sound-box carrying a diaphragm provided with rigidly affixed recording and reproducing styli in combination with a weight, means whereby the effective portion of said weight will be carried by the sound-box during the reproducing operation, and a support independent of said sound-box and adapted to carry the effective part of said weight during the recording operation.

12. In a sound recording and reproducing machine, a sound-box carrying a diaphragm, the latter having recording and reproducing styli rigidly fixed thereto in combination with a weight, said sound-box and weight being pivotally mounted on independent axes and means whereby the weight may be brought to bear upon the sound box by a relative movement of said parts upon their axes.



ing machine, a pivoted frame carrying a diaphragm, two stylus points adapted to co-operate with said diaphragm for the recording and reproducing operations respectively,  
5 and means extraneous to the frame whereby the reproducing stylus point may be caused to bear more heavily upon the record tablet when it is in operation than does the recording stylus point when it is in operation.

10 13. In a talking machine, a pivoted frame carrying a diaphragm, in combination with a weight mounted independently of the frame, and means whereby the weight may be applied to and removed from the frame  
15 to alter the downward pressure thereof.

14. In a sound recording and reproducing machine, a sound box carrying a diaphragm and two styli, the weight of the sound box being normally applied to the stylus which is in operative position, in combination with a weight adapted to be added  
20 to that of the sound box while a particular one of the styli is in operative position.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

JOHN H. J. HAINES.

Witnesses:

WALDO M. CHAPIN,  
JAMES D. ANTONIO.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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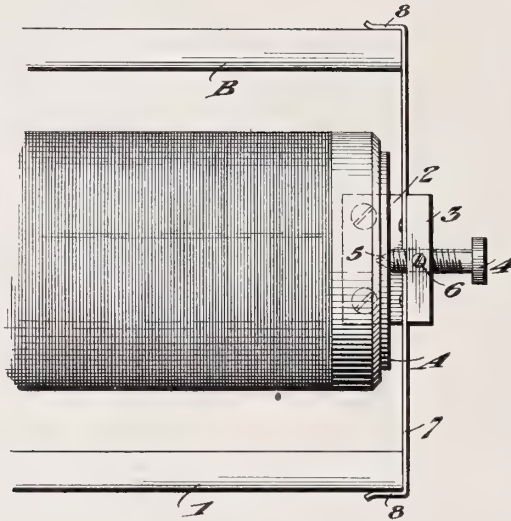


E. ROOS.  
GATE FOR GRAPHOPHONES.  
APPLICATION FILED JULY 20, 1911.

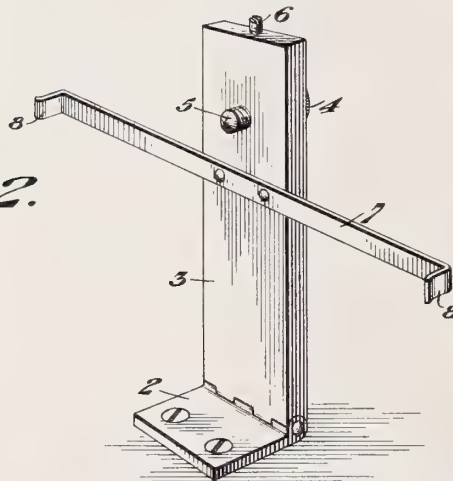
1,042,275.

Patented Oct. 22, 1912.

*Fig. 1.*



*Fig. 2.*



Witnesses

Lloyd W. Patch  
A. A. Hammond

Inventor

Emil Roos  
By Louis Bagger and Co  
his Attorneys

# UNITED STATES PATENT OFFICE.

EMIL ROOS, OF MANISTEE, MICHIGAN.

GATE FOR GRAPHOPHONES.

1,042,275.

Specification of Letters Patent.

Patented Oct. 22, 1912.

Application filed July 20, 1911. Serial No. 639,615.

*To all whom it may concern:*

Be it known that I, EMIL ROOS, a citizen of the United States, residing at Manistee, in county of Manistee and State of Michigan, have invented certain new and useful Improvements in Gates for Graphophones, of which the following is a specification.

My invention relates to an improvement in gates or supports for supporting an end of the cylinder of a graphophone, and for preventing the disengagement or accidental removal of the record from the cylinder roll.

The invention consists in other novel features of construction and combinations of parts which will be hereinafter fully described and pointed out in the claim.

In the accompanying drawings:—Figure 1 is a top plan view, showing the invention applied to a machine, and Fig. 2 is a perspective view of the invention.

A, represents the cylinder roll, and B is the rod upon which a carriage (not shown) slides. Bar 1 is located opposite to the rod B, and on the opposite side of the cylinder A for forming a support for the carriage during its operation.

The gate comprises a base 2, which is secured to the machine bottom; and pivotally connected to the base 2 is a plate 3. A screw-threaded pin 4 is mounted upon the plate 3 and is provided with a tapering end 5, which engages the end of the cylinder forming a pivot or journal upon which the cylinder will revolve. A screw 6 vertically mounted upon the plate 3 engages the screw-pin 4 for holding it in its adjusted position. A spring steel bar 7 is connected to the plate 3, and the ends of the bar extend at right angles to the main portion, the right-angular ends 8 of the bar engaging the rod B and the bar 1 for holding the plate 3 in a vertical position.

This form of gate will support the free end of the cylinder roll, and insure its running true. The bar 7 will also form a means to prevent any accidental removal of the record roll, and when it is desired to remove the record from the cylinder, the bar is disengaged from the rod B and bar 1, when the plate 3 can be swung downward so that it will be out of the path of the record as it is being removed from or inserted upon the cylinder.

From the foregoing, it will be seen that the gate can be readily connected to or disengaged from the form or support which carries the carriage during its operation, and that the gate can be fastened to any suitable part of the machine where it will perform the best results.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

The combination with a carriage frame and cylinder, of a base, a plate pivotally connected to the base adapted to be swung to a vertical position, a screw threaded pivot pin adjustably received within a correspondingly screw threaded orifice in the plate, a set screw in position to engage the pivot pin, a resilient bar connected to the plate and extending horizontally thereto, means connecting the bar to the plate at the center of the bar and a spring catch on each end of the bar in position to engage with the carriage frame when the gate is swung to an operative position.

In testimony whereof I affix my signature, in the presence of two witnesses.

EMIL ROOS.

Witnesses:

CHARLES N. BELCHER,  
BERTHA A. JOHANNESSEN.





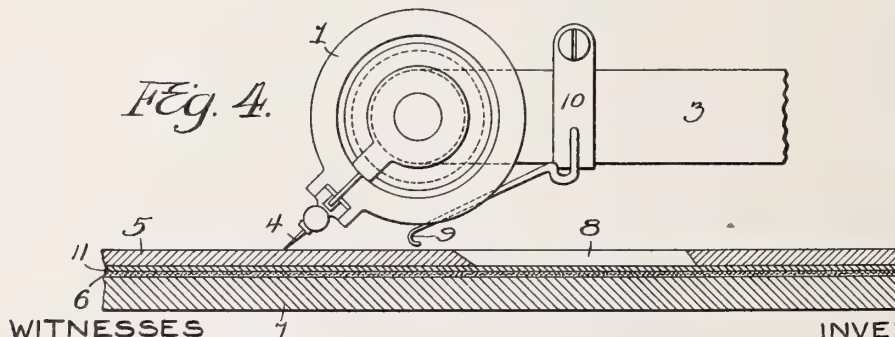
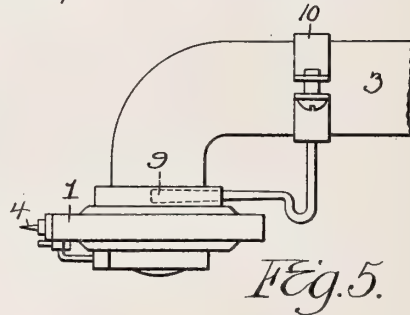
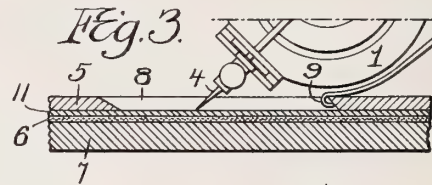
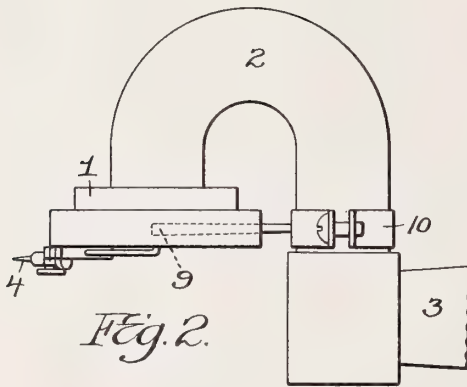
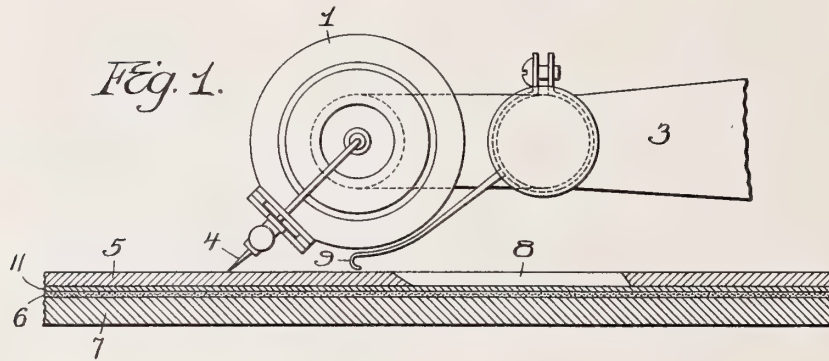


R. DE LAN.  
 AUTOMATIC RECORD STOPPING DEVICE FOR TALKING MACHINES.  
 APPLICATION FILED DEC. 6, 1911.

1,042,535.

Patented Oct. 29, 1912.

2 SHEETS—SHEET 1.



WITNESSES  
 Hamilton J. Turner  
 Kate A. Beadle

INVENTOR  
 RICHIE DE LAN  
 BY HIS ATTORNEY  
 Harry Smith



R. DE LAN.  
 AUTOMATIC RECORD STOPPING DEVICE FOR TALKING MACHINES.  
 APPLICATION FILED DEC. 6, 1911.

1,042,535.

Patented Oct. 29, 1912.

2 SHEETS—SHEET 2.

Fig. 11.

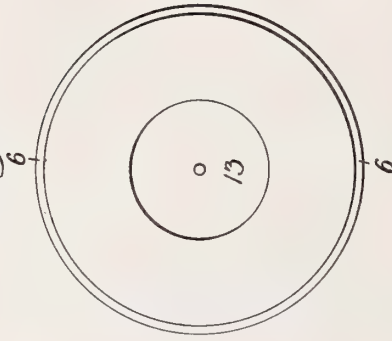


Fig. 10.

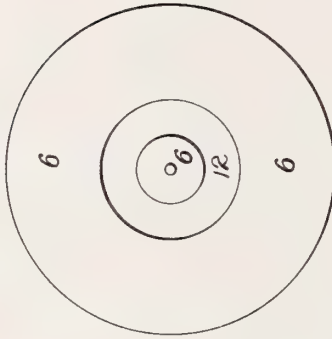


Fig. 9.

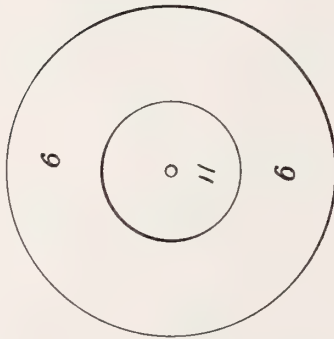


Fig. 6.

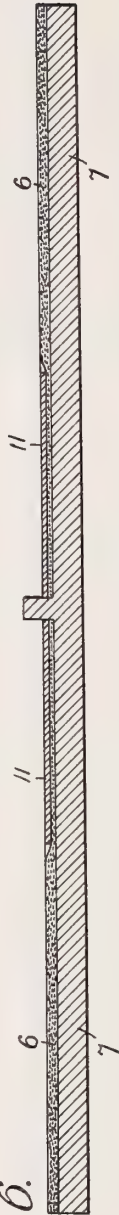


Fig. 7.

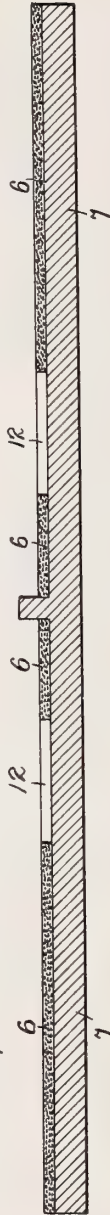


Fig. 8.



WITNESSES

*Hamilton J. Turner*  
*Kate A. Beadle*

INVENTOR  
 RICHIE DE LAN  
 BY HIS ATTORNEY  
*Harry Smith*

# UNITED STATES PATENT OFFICE.

RICHIE DE LAN, OF PHILADELPHIA, PENNSYLVANIA.

AUTOMATIC RECORD-STOPPING DEVICE FOR TALKING-MACHINES.

1,042,535.

Specification of Letters Patent.

Patented Oct. 29, 1912.

Application filed December 6, 1911. Serial No. 664,225.

*To all whom it may concern:*

Be it known that I, RICHIE DE LAN, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Automatic Record-Stopping Devices for Talking-Machines, of which the following is a specification.

The object of my invention is to provide simple and effective means for automatically stopping the rotation of the disk record of a talking machine when the end of the record is reached, an object which I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of one form of disk talking machine with a record-stopping device in accordance with my invention, the parts being in the position assumed when the end of the record is being approached; Fig. 2 is a plan or top view of the parts shown in Fig. 1; Fig. 3 is a view similar to Fig. 1, but showing the parts in the position assumed after the end of the record has been reached; Fig. 4 is a view similar to Fig. 1, but illustrating the application of my improved record-stopping device to a machine of a slightly different type from that shown in Fig. 1; Fig. 5 is a plan or top view of the parts shown in Fig. 4; Figs. 6 to 8 are sectional views illustrating different constructions of turntables for use in connection with my improved record-stopping attachment, and Figs. 9 to 11 are top views, on a reduced scale, of said turntables.

In Fig. 1 of the drawing, 1 represents the usual sound box hung by means of the gooseneck connection 2 to the free end of the swinging arm 3, the diaphragm of the sound box being acted upon by the stylus 4 which is actuated by the grooves of the record so as to vibrate the diaphragm and reproduce the sounds represented by the grooves of the record. The disk 5 carrying the record lies upon the baize-covered surface 6 of a turntable 7 which is rotated by means of a spring or other motor.

A serious objection to talking machines as now used arises from the necessity of stopping the rotation of the turntable as soon as the reproduction of the record has been completed, and it is the object of my invention to dispense with this necessity. This object I attain by forming in the record disk, at the end of the record thereon, an opening for the reception of a hook carried by the

sound box arm and serving by engagement with the advancing wall of said opening to arrest the further rotation of the record disk after the end of the record has been reached, the disk, by reason of its contact with the baize covered surface of the turntable, then acting as a friction brake and gradually bringing the turntable itself to a standstill.

In Figs. 1, 3 and 4 of the drawing, the opening in the record-disk is represented at 8 and the engaging hook at 9, said hook projecting from a clamp ring 10 which engages some convenient part of the sound box carrying arm, as shown in Figs. 2 and 4. The hook 9 bears such relation to the end of the stylus 4 that when the latter is traveling in the groove of the record the hook will be above and free from contact with the surface of the record disk, but, as soon as the needle falls into the opening 8 in the record disk, the hook will be permitted to descend to a point below the top of the disk and will therefore engage and retain the advancing wall of the disk, as shown in Fig. 3. In order to prevent the stylus or hook from engaging and injuring the baize cover of the turntable the latter may have a thin metal plate applied to it throughout that portion with which the hook or needle is likely to come into contact, such plate being shown for instance at 11 in Figs. 1, 3, 4, 6 and 9, or the baize cover may be removed from the turntable throughout this area, as shown for instance at 12 in Figs. 7 and 10, or a special baize covered plate 13 (Fig. 11) may be applied to the ordinary baize-covered turntable, the baize cover being removed from this plate throughout the area likely to be engaged by the retaining hook or stylus 4. The hook 9 is preferably undercut, as shown in the drawings, and the advancing wall of the opening 8 is likewise undercut so as to prevent the hook from being disengaged from the advancing wall of the opening when it comes into contact with the same, although a hook having a right-angled bend and a record disk having an opening with straight wall might be used, if desired. The forward end of the opening 8 is preferably beveled as shown in Figs. 1, 3 and 4, so as to permit the stylus 4 to slide gently down into the opening, and the term "opening" as used in this specification is also intended to cover a recess which does not extend completely through the record disk, the latter form of opening being pre-



ferred however, as being the easier to produce.

I claim:

5 1. The combination of the record-carrying turntable of a talking machine, and the sound-box carrying arm, with a record disk having an opening therein at the end of the record, and a hook for engaging with the advancing wall of said opening and arrest-  
10 ing the further rotation of the record.

2. The combination of the record-carrying turntable of a talking machine, and the sound-box carrying arm, with a record disk having an opening therein at the end of the  
15 record, and a hook for engaging with the advancing wall of said opening and arresting the further rotation of the record, the hook being intumed and the advancing wall of the opening in the record being undercut.

20 3. The combination of the baize covered record-carrying turntable of a talking machine, and the stylus-carrying sound-box, with a record disk having an opening therein at the end of the record, a hook for en-  
25 gaging with the advancing wall of said

opening and arresting the further rotation of the record, and means for preventing contact of the stylus and hook with the baize-covering of the turntable when said stylus and hook enter the opening in the record disk. 30

4. The combination of the record-carrying turntable of a talking machine and the stylus-carrying sound-box, with a record disk having an opening therein at the end  
35 of the record, and a hook for engaging with the advancing wall of said opening and arresting the further rotation of the record, said hook bearing such relation to the stylus that it will be supported in position above  
40 the top of the record while the stylus is in engagement with the record groove.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

RICHIE DE LAN.

Witnesses:

KATE A. BEADLE,  
HAMILTON D. TURNER.

---

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

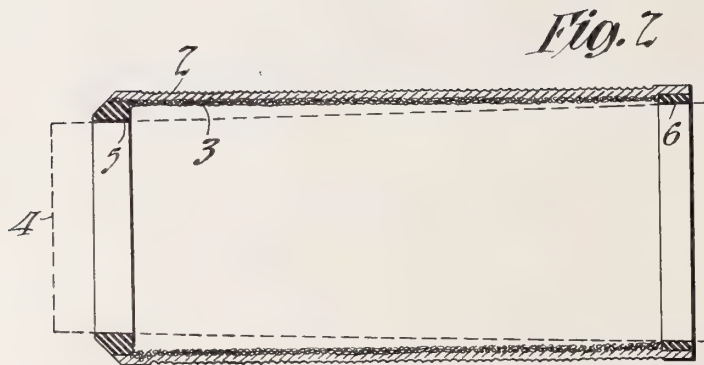
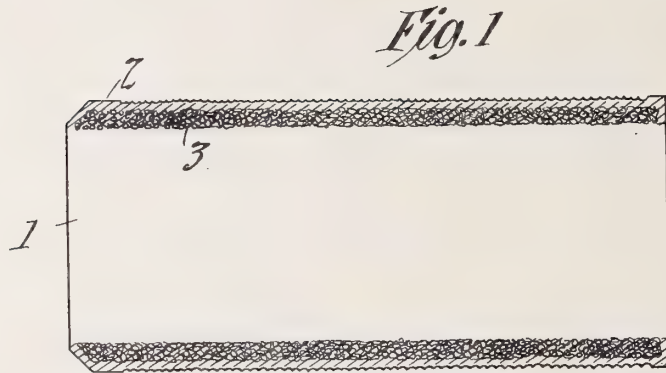
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J. W. AYLSWORTH.  
PHONOGRAPH RECORD AND PROCESS FOR MAKING THE SAME.  
APPLICATION FILED MAY 25, 1909.

1,043,389.

Patented Nov. 5, 1912.



*Witnesses:*  
Frank D. Lewis  
Dyer Smith

*Inventor:*  
Jonas W. Aylsworth  
by Frank L. Ayer  
Atty.

# UNITED STATES PATENT OFFICE.

JONAS W. AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH-RECORD AND PROCESS FOR MAKING THE SAME.

1,043,389.

Specification of Letters Patent.

Patented Nov. 5, 1912.

Application filed May 25, 1909. Serial No. 498,357.

*To all whom it may concern:*

Be it known that I, JONAS W. AYLSWORTH, a citizen of the United States, and a resident of East Orange, Essex county, New Jersey, have made a certain new and useful Invention in Phonograph-Records and Processes for Making the Same, of which the following is a description.

This invention relates to a novel form of a phonograph record and method of producing the same centrifugally, the record being claimed in this application and the method in a divisional application, Serial No. 719,094, filed September 7, 1912.

The object of my invention is to produce a light weight strong cylindrical phonograph record, which will have a hard resisting surface smooth and free from defects and a porous backing of a similar substance which will contribute mechanical strength and acoustic solidity without the use of as much material as would be necessary if the record were made solid or backed with solid material.

The result above referred to is accomplished by casting in a rotating mold a composition containing ingredients which cause the same to foam excessively or evolve gases during the formation of the record to cause the same to be spongy and porous, while the outer record surface of the same which is in contact with the mold will be free from bubbles and similar defects.

More specifically, my invention is accomplished by casting in the manner referred to a record of a composition, the ingredients of which react on sufficient application of heat to form a hard infusible condensation product. In my present invention, a composition of this character is made use of in which the ingredients are so chosen and proportioned as to cause excessive foaming or the evolution of dissociation gases during the transition of the material from the molten plastic state to a solid plastic or non-plastic state, the product, caused by the evolution of such gases, being porous and spongy throughout its mass, while the record surface thereof is smooth and free from bubbles.

A composition such as that described may be made by adding an excess of paraformaldehyde, di- or tri- oxymethylene, or other suitable aldehyde to a composition having a

formula such as Formula No. 1 in my application No. 496,060 for plastic composition and process of manufacturing the same, filed May 14, 1909. The formula referred to is:—(1.) Phenol resin 100 parts by weight, polymerized formaldehyde 5 to 7 parts by weight, benzoic anhydrid 5 to 10 parts by weight.

The excess of polymerized formaldehyde above the proportion in the foregoing formula causes the mass to foam during the transition from the molten plastic to the hard solid condition. With such a composition the surface next to the record surface of the mold is formed in a thin layer of material free from porosity. The thickness of such layer may be controlled at will by pouring in the mold first an amount of a mass so constituted that it will not foam while changing from the molten plastic to a non-plastic or a solid condition, subsequently pouring in the mold the mass which is designed to foam or evolve dissociation gases whereby the porous backing or body of the record is formed.

Attention is hereby directed to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a longitudinal cross section through a record made in accordance with my invention, and Fig. 2 is a longitudinal cross section through a similar record formed with bearing rings and shown mounted on the taper mandrel which is shown in dotted lines.

Referring to the drawings, the record 1 is formed having a smooth hard non-porous outer surface 2 and a porous spongy backing or body portion 3. In Fig. 2, a record of this character is shown mounted on the taper mandrel 4, the record being formed with suitable bearing rings 5 and 6. A record similar to that disclosed in Fig. 2 may be formed by casting the record material in a rotating mold in which bearing rings of hard rubber or other suitable material or of the final condensation product of a resinized phenol have been secured in position previous to the pouring of the record, in the manner disclosed in my application No. 493,053, filed April 29, 1909.

As is well known, the reaction between a phenol and an aldehyde is accompanied by the evolution of dissociation gases unless a

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counteracting pressure is employed. In the case of the process described and claimed in this application, the speed of rotation of the mold is insufficient to generate a counteracting pressure due to the centrifugal action sufficient to counteract the evolution of gases with substances in the proportions used.

In the formula above referred to as Formula No. 1 in my application No. 496,060, a certain proportion of benzoic anhydrid is included, this being an element which I denote a "final product solvent element" since it has the quality of combining or entering into solution with the other ingredients at an elevated temperature, causing the product to become somewhat plastic and free from internal stresses at such temperature, and forming a solid solution with the other ingredients of the product when cold. This material or materials having similar properties, as described in my above mentioned application, may be used or not as desired, in the spongy record composition here described and claimed.

The benzoic anhydrid in addition to being a "final product solvent element" is also a "water combining element", as described in my application Serial No. 496,060 referred to, that is, it has the properties of combining during the reaction with any traces of water which may be contained in the substance. Any other substance, such as various anhydrids of organic acids, may be used as an ingredient in the composition, to perform the same function if desired. Also it is to be understood that I am not limited to the substances in proportions referred to in the above mentioned formula, but that various combinations of phenols and aldehydes in various proportions may be used with good results so long as the proportion of aldehyde is sufficient to cause the evolution of gases in the mass during the formation of the record at the speed of rotation necessary to form the record.

While I have described my invention specifically in connection with phenol condensation products, it is to be understood that I am not necessarily limited thereto. For ex-

ample, a celluloid record may be formed having the general characteristics of my invention. In practicing the invention with this substance, a thin film of celluloid is first formed on the bore of the record from a suitable solution by evaporating away the solution to form a non-porous outer surface for the record cylinder. A further solution of celluloid is then introduced into the rotating mold and evaporation carried on more quickly than in the formation of the outer film, to cause foaming of the substance during the evaporation and the consequent formation of the spongy celluloid body or backing.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. As a new article of manufacture, a phonograph record formed of a hard infusible resinized phenol condensation product having an outer record surface smooth and non-porous, the remainder of the record body being spongy and porous, substantially as described.

2. As a new article of manufacture, a phonograph record formed of a hard homogeneous substance, non-plastic at ordinary temperatures, having a smooth non-porous record surface and a rigid porous spongy body, substantially as described.

3. As a new article of manufacture, a phonograph record having a hard, smooth resisting insoluble and infusible record surface and a porous spongy backing of the same material, substantially as described.

4. As a new article of manufacture, a phonograph record formed of a hard homogeneous substance, non-plastic at ordinary temperatures, having a smooth non-porous record surface and a rigid porous body of light weight, substantially as described.

This specification signed and witnessed this 22nd day of May, 1909.

JONAS W. AYLSWORTH.

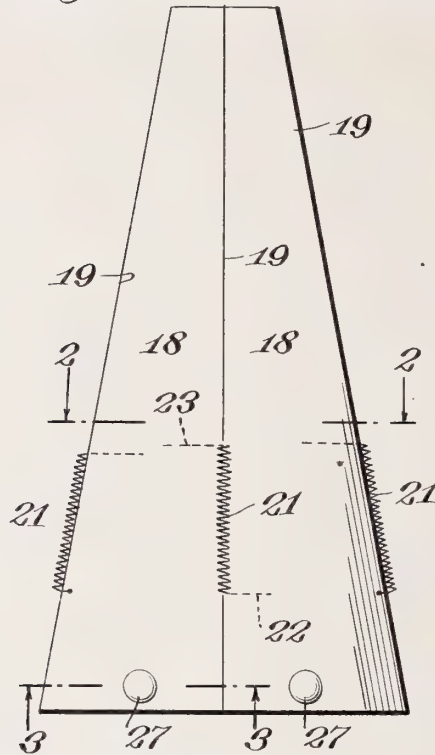
Witnesses:

DYER SMITH,  
JOHN M. CANFIELD.



1,044,917.

*Fig. 1.*



*Fig. 2.*

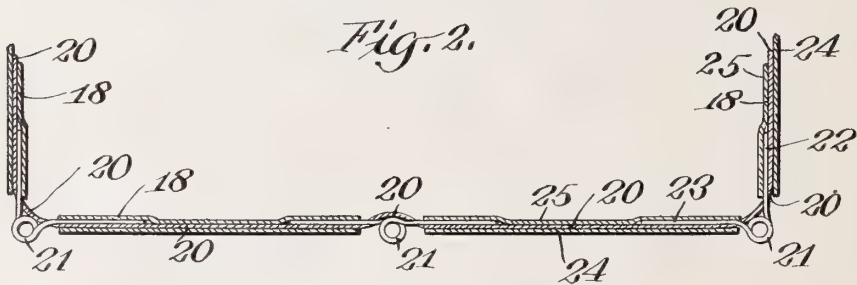
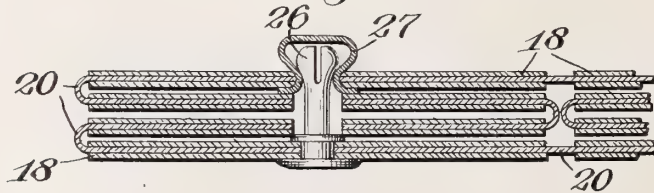


Fig. 3.



B. R. Hamburg  
John W. Morgan

Frank Z Rose

BY  
Alan M. Johnson  
ATTORNEY



# UNITED STATES PATENT OFFICE.

FRANK L. ROSE, OF NEW YORK, N. Y.

## KNOCKDOWN MEGAPHONE.

1,044,917.

Specification of Letters Patent.

Patented Nov. 19, 1912.

Application filed February 27, 1912. Serial No. 680,273.

*To all whom it may concern:*

Be it known that I, FRANK L. ROSE, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Knockdown Megaphones, of which the following is a specification, taken in connection with the accompanying drawings, which form a part of the same.

My invention relates to amplifying sound devices and more particularly to a knock down megaphone which may be formed of any suitable material and of any required size for the particular uses to which the megaphone is to be put.

My invention comprises such a knock-down megaphone formed of a plurality of substantially flat elements having some resilient means which is put under tension when the megaphone is collapsed and which will, by loosening a catch or similar device, cause the megaphone to automatically spring out into its distended position.

In the accompanying drawings showing illustrative embodiments of my invention and in which the same reference numerals refer to similar parts in the several figures,—Figure 1 is a side elevation of my megaphone formed of a plurality of separate connected hinged strips to permit the megaphone to be knocked down or collapsed into substantially the position shown in Fig. 3. Fig. 2 is a detail horizontal section substantially on the line 2—2 of Fig. 1 looking down in the direction of the arrows; the figure being shown on an enlarged scale; and Fig. 3 is a detail sectional view partly in side elevation substantially on the line 3—3 of Fig. 1, the megaphone being shown collapsed.

In my invention the megaphone is formed of a plurality of separate strips 18, 18 hinged along the lines 19, 19 in any suitable manner but preferably by means of an interposed piece of textile material 20, Fig. 2. In this form of my invention, I employ any suitable form of resilient means to automatically distend the sections 18, 18 when it is desired to use the megaphone. Various forms of automatic resilient means may be employed. I have shown simply by way of illustration a resilient means consisting of coil springs 21 mounted so that their longitudinal axis would substantially coincide with one of the edges 19 of the megaphone,

one arm 22 of the spring bears upon one of the strips 18, while the other arm 23 bears upon the adjacent strip 18. It is understood that preferably a plurality of such coil springs or resilient means are employed and preferably, though not necessarily, one coil spring for each of the meeting edges 19 of the sections 18, 18, though this number, of course, may be varied without departing from my invention.

Various means of mounting the resilient device within the megaphone may be employed. Simply by way of example, I have shown the two arms 22 and 23 of the coil spring received and secured between the outer strip of cardboard 24 and the inner strip of cardboard 25, the two with the textile material 20 forming one of the built up strips 18, Fig. 2.

It is, of course, to be understood that any suitable means may be employed for securing the resilient means to the megaphone, the one shown being simply by way of illustration.

When this form of my megaphone is in its distended or operative position, the resilient means is not under tension. When the megaphone is knocked down or collapsed, as shown for example in Fig. 3 the collapsing of the sections is resisted by the resilient means which are thereby put under tension. The megaphone is held in its collapsed position against the action of the spring or springs by any suitable means. I have shown by way of example such a locking means in Fig. 3 where the head 26 is riveted to one of the bottom strips 18 and the bell 27 to the upper strip 18, the two intermediate hinge strips being preferably provided with holes to permit the head 26 to pass through them to engage the bell 27 on the upper strip. Preferably I employ two such fastening devices, as shown for example in Fig. 1, the two being duplicates.

My invention is adapted for megaphones of any and every description wherein it is desirable for any purpose to temporarily knock them down into a minimum space to be carried, shipped or stored. My megaphone is adapted to be used with sound reproducing or recording devices, or simply as a pocket megaphone. My megaphones can be made at such a minimum expense that they can be readily used as advertising devices for any suitable advertising matter can be printed or otherwise placed on them, and



they can be given away by the advertiser or sold at a very low figure.

Having thus described this invention in connection with several illustrative embodiments thereof to the details of which I do not desire to be limited, what is claimed as new and what is desired to secure by Letters Patent is set forth in the appended claims.

1. In a knock down collapsible megaphone, the combination of a plurality of hinged sections, a coil spring mounted in line with the meeting surfaces of two adjacent sections, the arms of the coil spring being secured to different adjacent sections.

2. In a knock down collapsible megaphone, the combination of a plurality of hinged sections, a coil spring mounted in line with the meeting surfaces of two adjacent sections, the arms of the coil spring be-

ing secured to different adjacent sections, and means to hold the megaphone in its collapsed position and the springs under tension.

3. In a collapsible knock down megaphone, the combination of a plurality of hinged sections, each section formed of a plurality of built up parts, a strip of textile material in the different sections and extending between each pair of built up sections to form a hinge, one or more coil springs mounted along the meeting surfaces of two adjacent sections and provided with opposed arms which are secured between the plies of the adjacent built up sections.

FRANK L. ROSE.

Witnesses:

ALAN M. JOHNSON,  
ROSE MENK.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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W. B. NICHOLS.  
 NEEDLE FOR TALKING MACHINES, &c.  
 APPLICATION FILED MAY 28, 1912.

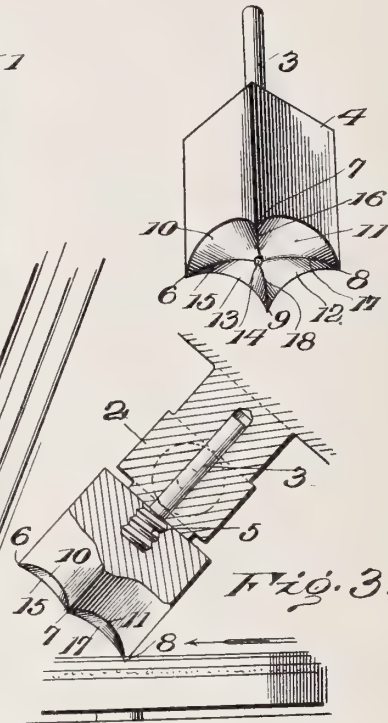
1,045,593.

Patented Nov. 26, 1912.

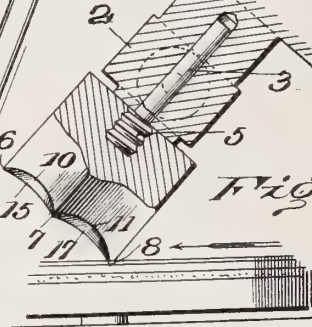
*Fig. 1.*



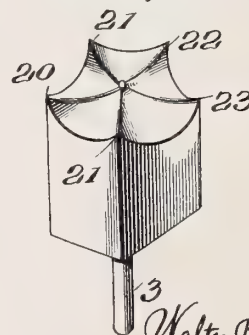
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



Witnesses  
*W. A. Williams*  
*J. J. Keenan*

Inventor  
*Walter B. Nichols*  
 By *Robertson & Johnson*  
 Attorneys

# UNITED STATES PATENT OFFICE.

WALTER B. NICHOLS, OF LEXINGTON, KENTUCKY.

NEEDLE FOR TALKING-MACHINES, &c.

1,045,593.

Specification of Letters Patent.

Patented Nov. 26, 1912.

Application filed May 28, 1912. Serial No. 700,276.

*To all whom it may concern:*

Be it known that I, WALTER B. NICHOLS, a citizen of the United States, and a resident of Lexington, in the county of Fayette and State of Kentucky, have invented certain new and useful Improvements in Needles for Talking-Machines, &c., of which the following is a specification.

This invention relates to improvements in needles for use in talking machines, and the object of the invention is to provide a needle which may be made of wood or fibrous material and at the same time have a number of needle points, thereby providing a multiple needle.

In its preferred embodiment my invention has a plurality of individual points connected together by curved surfaces whereby a file or tool of the proper character may be employed to file or grind the curved surfaces so as to renew the needle points when worn.

In the drawings accompanying and forming part hereof: Figure 1 represents part of a talking machine having a needle made in accordance with my invention connected with the sound box thereof. Fig. 2 is a perspective view of the needle detached. Fig. 3 is a view partly in section of my multiple needle in a sound box. Fig. 4 is a view of a modified form.

Referring now to the details of the drawings by numerals: 1 designates a sound box of ordinary construction to the socket 2 of which is secured the shank 3 of my multiple needle. The needle itself is designated by the numeral 4 and in its preferable embodiment consists of a solid piece of box-wood, although other characters of wood may be employed. The shank 3 is of the size adapted to fit into the inner sockets of talking machines and it has an enlarged screw threaded member 5 whereby the shank is secured to the needle 4 as clearly illustrated in Fig. 3. The needle 4, if of square configuration as illustrated in Figs. 1 and 2 is provided with four distinct needle points 6, 7, 8 and 9, each point being connected to its adjacent point by means of the curved surfaces 10, 11, 12 and 13. When these curved surfaces are made of the proper configuration, the points 6, 7, 8 and 9 are formed which are connected to a central point 14 by means of substantially straight portions 15, 16, 17 and 18, these last four portions forming a kind of web which gives strength and backing to the points 6, 7, 8 and 9. If desired, instead of

making a four sided needle the needle may be made with a smaller or larger number of sides and needle points, one modified form being shown in Fig. 4 wherein there are five needle points 20, 21, 22, 23 and 24.

The needle is used in substantially the same way as any other needle in that its shank 3 is inserted in the sound box 2 and secured therein by the set screw in the usual manner, the needle having been first moved to such a position that one of the points will be in just the proper position to enter one of the grooves of the record, as illustrated in Fig. 1. In the practical use of my multiple needle, I have found that I get substantially the same volume from each of the needle points as is usually obtained from the use of steel needles and at the same time I am enabled to provide needle points which give an added brilliancy to all kinds of musical selections, "picking up", as it does, the finer shadings, which with other needles or styli are almost entirely lost. It does not injure records, but eliminates all "scratching" and the metallic blast so common and objectionable in steel needles. Acting as a "buffer", the record is gradually polished and thereby improved, insuring the longest possible life to it. If the wood of which the multiple needle is made is of box-wood or of similar hard wood, the needle points may be used more than once without sharpening. At the same time, one of my multiple needles may be used an enormous number of times by filing and grinding the curved surfaces 10, 11, 12 and 13 with a file or other suitable tool of the proper configuration. Therefore, one or two of my multiple needles and a sharpening tool may be used for a long period of time and the necessity of keeping on hand boxes of needles is thus avoided.

What I claim as my invention is:

1. A needle for talking machines comprising a shank and a body projecting from said shank of relatively large size compared therewith, said body having a plurality of corners on the bottom opposite the shank forming independent reproducing points, and said bottom having a hollow surface forming said points, substantially as described.

2. A needle for talking machines comprising a shank and a body projecting therefrom, said body having a plurality of corners on the bottom of the body opposite the



shank forming independent reproducing points, and said bottom having reëntrant surfaces forming said points, substantially as described.

- 5 3. A needle for talking machines comprising a shank and a wooden or fibrous body projecting from said shank of relatively large size compared therewith, said wooden or fibrous body having a plurality of corners on the bottom opposite the shank forming independent reproducing points, and said bottom having curved surfaces forming said reproducing points, whereby said curved surfaces may be filed or dressed down to renew or sharpen said independent reproducing points, substantially as described.

- 10 4. A needle for talking machines comprising a shank and a body provided with a plurality of independent reproducing points connected by reëntrant surfaces disposed at a relatively large angle to the longitudinal axis of the needle, substantially as described.

- 15 5. A needle for talking machines comprising a shank and a wooden or fibrous block of rectangular form, the shank being se-

cured at one end of said block and the bottom of said block opposite said shank having reëntrant surfaces forming a plurality of independent reproducing points at the corners of the block, whereby the reëntrant surfaces forming the bottom of the block may be filed or dressed down to renew or sharpen said independent reproducing points, substantially as described.

- 35 6. A needle for graphophones or the like comprising a shank and a wooden or fibrous body projecting therefrom, said fibrous body having a plurality of independent points connected together by curved surfaces whereby said curved surfaces may be filed or dressed down to renew or sharpen said points, and said points being connected together by webs affording a backing for the points, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WALTER B. NICHOLS.

Witnesses:

C. Y. FREEMAN,  
W. P. PARRISH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."



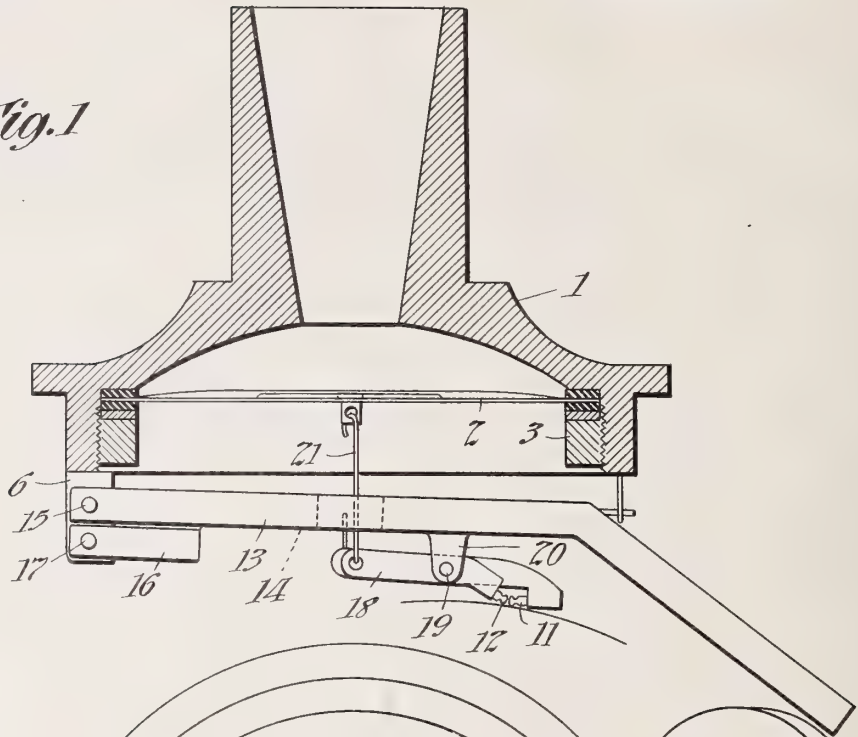
T. A. EDISON.  
 PHONOGRAPH REPRODUCER.  
 APPLICATION FILED JUNE 11, 1908.

1,046,159.

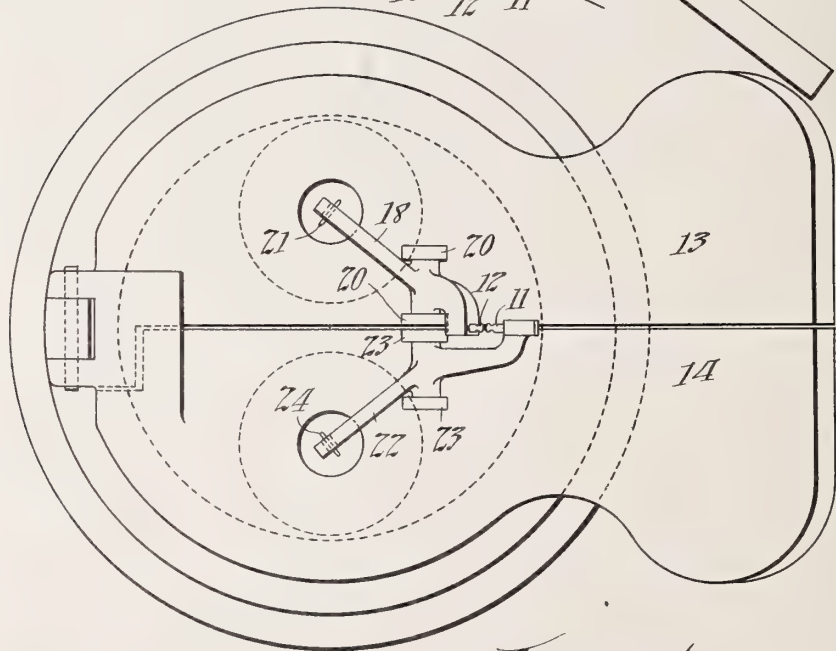
Patented Dec. 3, 1912.

2 SHEETS—SHEET 1.

*Fig. 1*



*Fig. 2*



*Witnesses:*

Francis D. Lewis  
 Herbert H. Dyke

*Inventor:*

Thomas A. Edison  
 by Frank L. Ryan  
*Att'y.*



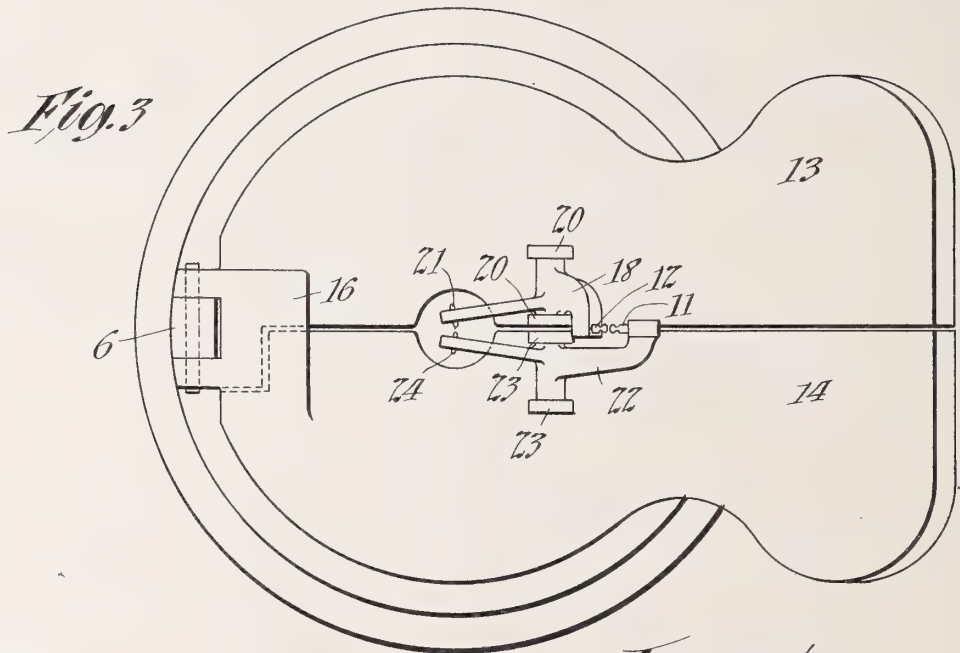
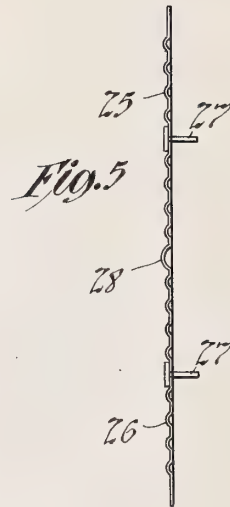
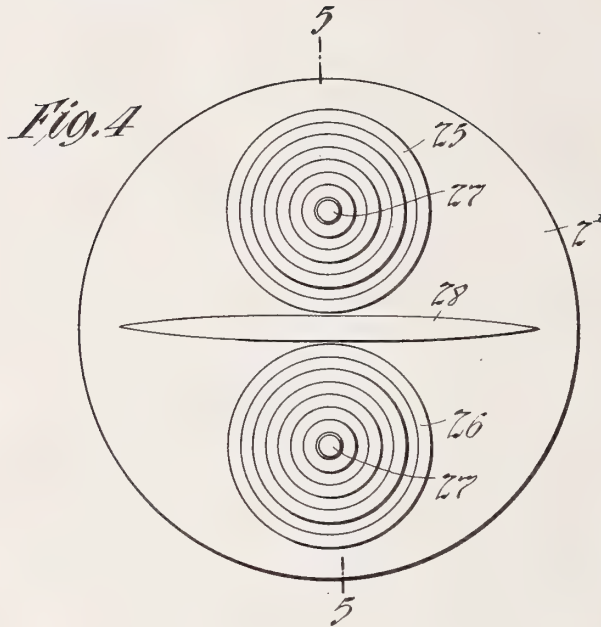


T. A. EDISON.  
 PHONOGRAPH REPRODUCER.  
 APPLICATION FILED JUNE 11, 1908.

1,046,159.

Patented Dec. 3, 1912.

2 SHEETS—SHEET 2.



*Witnesses:*  
 Frank Lewis  
 Herbert H. Dyke

*Inventor:*  
 Thomas A. Edison  
 by Francis L. Lee  
 Atty.

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, ORANGE, NEW JERSEY, ASSIGNOR TO  
THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH-REPRODUCER.

1,046,159.

Specification of Letters Patent.

Patented Dec. 3, 1912.

Application filed June 11, 1908. Serial No. 437,844.

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonograph-Reproducers, of which the following is a description.

My invention relates to reproducers for phonographs, and more particularly to that type which is adapted to operate upon a sound record in the form of a groove having elevations and depressions corresponding graphically to the original sound waves.

The object of my invention is to secure a louder and more perfect reproduction than can be obtained from the ordinary form of reproducer, or to secure a reproduction of equal loudness with less wear upon the record.

With this end in view I employ a pair of reproducer styluses arranged one slightly in advance of the other, with respect to the record groove.

In an application for Letters Patent filed concurrently herewith, I have described and broadly claimed a reproducer constructed on this principle, and have specifically claimed that form in which both styluses are carried by a single lever which is mounted on a single floating weight.

The present invention relates to an improved reproducer in which the two styluses are mounted upon separate stylus levers, which are mounted preferably upon separate floating weights, pivoted so as to have independent movement, and said stylus levers may be connected either to the same point of a single diaphragm or to different parts of a single diaphragm, or they may be connected to separate diaphragms if desired.

In order that the invention may be more fully understood, reference is made to the accompanying drawing of which—

Figure 1 is a side elevation, partly in section, of a reproducer constructed in accordance with my invention, and showing the two stylus levers connected to different parts of a single diaphragm; Fig. 2 is a bottom plan view of the reproducer of Fig. 1; Fig. 3 is a similar view of a reproducer in which the two stylus levers are connected to the

center of a single diaphragm; Fig. 4 is a plan view of the diaphragm of Fig. 1, and Fig. 5 is a section on line 5—5 of Fig. 4.

The reproducer shown in Figs. 1 and 2 consists of the sound box body 1 of ordinary form, within which the diaphragm 2 is clamped by a ring 3 in the usual manner. There are a pair of floating weights 13 and 14 respectively, the former of which is pivoted at 15 to the block 6 carried by the body 1, and the weight 14 has a downwardly extending lug 16 which is pivoted at 17 to the said block 6. The weights 13 and 14, as shown, lie side by side in the same general plane and on opposite sides of a plane parallel to the direction of the pivotal movement thereof. The stylus lever 18 is pivoted at 19 to a pair of lugs 20, which depend from the weight 13, and a stylus 12 is secured in a socket formed in the end of the said lever 18, the opposite end of the said lever being connected by the link 21 to the diaphragm 2 at a point eccentric thereto. The stylus lever 22 is pivoted to the lugs 23, which depend from the floating weight 14, the axis of said lever being in the same line as that of the lever 18. One end of the lever 22 is formed with a socket within which is secured the stylus 11, and the other end of the lever 22 is connected by a link 24, with the diaphragm 2 at a point eccentric and opposite to that at which the link 21 is connected. The styluses 11 and 12 may be of any suitable form adapted to track the record groove, those shown being of the button-ball type, as fully set forth and claimed in my Patent Reissue No. 11,857, dated September 25, 1900.

Figs. 4 and 5 show the preferred form of diaphragm, which may be of metal, such as hard copper, or any other suitable material, and is formed with two series of annular corrugations 25 and 26 respectively, eyes 27 being secured at the centers of each of said sets of corrugations, for receiving the ends of the links 21 and 24 respectively. A groove 28 extends diametrically across nearly the entire width of the diaphragm, and divides the same into halves which vibrate practically independently of each other. It is obvious that if desired the links 21 and 24 may be connected to a pair of separate circular diaphragms, correspond-

ing to the annular members 25 and 26, or the diaphragm 2' may be cut in two along the line of the groove 28 to form separate diaphragms.

5 The reproducer of Fig. 3 differs from that of Figs. 1 and 2 only in the fact that the levers 18 and 22 are of somewhat different form and the links 21 and 24 are connected to the center of the diaphragm, which may  
10 be of any desired form or material.

Having now described my invention, what I claim is:

1. A phonograph reproducer comprising a sound box body provided with a single  
15 diaphragm, a pair of floating weights pivoted to the sound box body and lying side by side and on opposite sides of a plane parallel to the direction of the pivotal movement thereof, and a stylus lever and stylus  
20 supported by each weight, said levers being connected to said diaphragm and said styluses being adapted to coact with a sound record and supported with their operative surfaces located in substantially the same  
25 plane parallel to the grooves of the sound record when the reproducer and record are in operative position and in substantially the same plane tangent to said record, substantially as set forth.

30 2. A phonograph reproducer comprising a sound box body and a single diaphragm, a pair of styluses, adapted to co-act with a sound record, means supporting said styluses with the operative surfaces of the latter located in substantially the same plane  
35 parallel to the grooves of the sound record when the reproducer and record are in operative position, one of said styluses being slightly in advance of the other, and connections from said styluses to widely separated portions of said diaphragm, substantially as set forth.

3. In a phonograph reproducer, the combination of a sound box body provided with  
45 a single diaphragm having a plurality of sets of annular corrugations whose centers are at a substantial distance apart, a plurality of independent floating weights pivoted to the sound box body, and a stylus  
50 lever and stylus carried by each floating weight, the stylus levers being respectively connected to the diaphragm at the centers

of the sets of annular corrugations, substantially as set forth.

4. In a phonograph reproducer, the combination of a sound box body provided with a single diaphragm having a diametric groove dividing the same into sections adapted to vibrate substantially independently of each other, a plurality of independent floating weights pivoted to the sound box body, and a stylus lever and stylus carried by each of the floating weights, the stylus levers being respectively connected to different sections of the diaphragm, substantially as set forth.

5. A phonograph reproducer comprising a body, a pair of floating weights, a stylus lever supported by each weight, and a stylus carried by each lever, said styluses adapted to co-act with a sound record and supported with their operative surfaces located in substantially the same plane parallel to the grooves of the sound record when the reproducer and record are in operative position, one of said styluses being in advance of the other, and both being positioned to co-act with the record at the same time, a single diaphragm, and connections from each stylus lever to said diaphragm, substantially as set forth.

6. A phonograph reproducer diaphragm provided with a plurality of sets of annular corrugations whose centers are at a substantial distance from each other, substantially as set forth.

7. A phonograph reproducer diaphragm provided with a plurality of sets of annular corrugations whose centers are at a substantial distance from each other, and a groove separating said sets of corrugations and extending transversely to a line connecting their centers, substantially as set forth.

8. A phonograph reproducer diaphragm having a diametric groove dividing the same into sections adapted to vibrate substantially independently of each other, substantially as set forth.

This specification signed and witnessed this 8th day of June 1908.

THOS. A. EDISON.

Witnesses:

FRANK L. DYER,  
FRANK D. LEWIS.







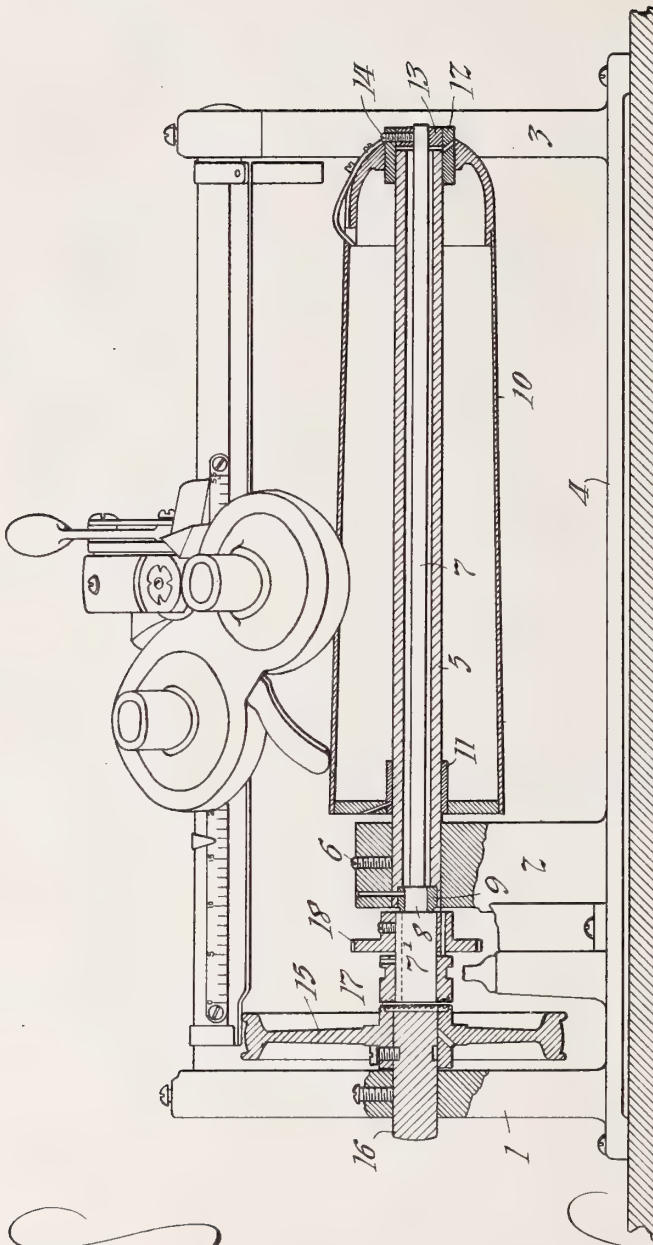
C. L. HIBBARD.

PHONOGRAPH.

APPLICATION FILED JULY 31, 1909.

1,046,188.

Patented Dec. 3, 1912.



*Witnesses:*

*Frank D. Lewis*  
*Dyer Smith*

*Inventor:*

*Charles L. Hibbard*  
*by Frank D. Lewis*  
*Atty.*

# UNITED STATES PATENT OFFICE.

CHARLES L. HIBBARD, OF EAST ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH.

1,046,188.

Specification of Letters Patent.

Patented Dec. 3, 1912.

Application filed July 31, 1909. Serial No. 510,596.

*To all whom it may concern:*

Be it known that I, CHARLES L. HIBBARD, a citizen of the United States, and a resident of East Orange, in the county of Essex and State of New Jersey, have made a certain new and useful Invention in Phonographs, of which the following is a description.

My invention relates to phonographs, and more particularly to that type of phonograph in which the use of an end gate is dispensed with.

The principal object of my invention is the provision of novel and efficient means for supporting the mandrel of a phonograph with sufficient rigidity without the use of an end gate. In conformity with this object, a rigid stationary tube is supported outside the mandrel of the phonograph and extends therethrough, the mandrel being rotatably supported upon the periphery of said tube, while at the same time the driving shaft to which power is applied to rotate the mandrel extends through the stationary tube and is connected to the mandrel rigidly or otherwise to drive the latter preferably beyond the outer end of the stationary tube.

Other objects of my invention consist in the construction of parts and combinations of elements, as will be hereinafter more particularly described and pointed out.

Referring to the accompanying drawing, forming part of this specification, the figure represents a vertical longitudinal section through the mandrel of a phonograph equipped with my invention, certain parts of the phonograph being shown in side elevation.

Referring to the drawing, the standards 1, 2 and 3 rise from the bed plate 4. The stationary tube or sleeve 5 is supported at one end in standard 2, the set screw 6 or equivalent device securing it rigidly in position. The tube 5 is supported only at the one end, as described, and accordingly, should be formed of such a material as to insure its absolute rigidity, steel being preferred. The driving shaft 7 for the phonograph is mounted to extend through the tube 5, the shaft 7 being provided adjacent its left hand end as shown in the drawings, with a portion of enlarged diameter 8, which is adapted to rotate within the bearing sur-

face 9 within the left hand end of the tube 5. It is, however, obvious that this bearing surface might equally well be provided beyond the left hand end of the tube 5 in the standard 2.

The mandrel 10 is mounted to rotate upon the periphery of stationary sleeve 5, the mandrel being provided at its two ends with short bearing surfaces 11, 12 mounted upon the periphery of the sleeve 5. The bearing surface 12, which is secured to or integral with the outer end of the mandrel 10, has secured thereto or integral therewith the disk 13, within the center of which the right hand end of shaft 7 is supported, set screw 14 securing the shaft 7 rigidly to the members 12, 13 and the mandrel 10 to which the latter is secured. It is, however, obvious that any connection by which power might be transmitted from shaft 7 to mandrel 10 is sufficient for the purpose. The shaft 7 is supported by its bearing in bearing surface 9 and by its connection with disk 13 in the axis of sleeve 5, the diameter of shaft 7 being considerably less than that of the bore of sleeve 5.

Power is transmitted to the driving shaft of the phonograph from a usual motor by means of a belt, neither the belt nor the motor being here shown, the belt encircling the pulley 15 on the shaft 16 which is supported in upright 1. Shaft 16 is axially in line with the left hand end of shaft 7 to which it is adapted to be connected by the clutch 17, which is adapted to be slid back and forth upon the enlarged diameter 7' at the extreme left of the driving shaft 7. The gear 18 is also mounted upon the portion 7' of the driving shaft 7, and from this gear by connections not shown, the feed screw of the phonograph is driven in the usual manner. Lubricant may be supplied to the various bearing surfaces by the oil holes shown.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. In a phonograph, the combination with a rotatable mandrel, of a mandrel shaft secured thereto to drive the same and extending therethrough, means connecting said mandrel to said shaft adjacent the outer end of the latter, a stationary sleeve surrounding said shaft, and means exterior of said

mandrel for supporting said sleeve and shaft, said mandrel being formed with bearing surfaces rotatably mounted upon the exterior of said sleeve, and said shaft being  
5 of less diameter than the bore of said sleeve, substantially as described.

2. In a phonograph, the combination with a rotatable mandrel, of a mandrel shaft secured thereto to drive the same and extending  
10 ing therethrough, means connecting said mandrel to said shaft adjacent the outer end of the latter, and a stationary sleeve surrounding said shaft, said mandrel being  
15 formed with bearing surfaces rotatably mounted upon the exterior of said sleeve, and said shaft being of less diameter than the bore of said sleeve, substantially as described.

3. In a phonograph, the combination with a rotatable mandrel, of a mandrel shaft secured thereto to drive the same and extending  
20 ing therethrough, means connecting said mandrel to said shaft adjacent the outer end of the latter, a stationary sleeve surrounding said shaft, and means exterior of the said mandrel for supporting said sleeve  
25 and shaft, said mandrel being formed with short bearing surfaces adjacent its ends rotatably mounted upon the exterior of said sleeve, and said shaft being of less diameter  
30 than the bore of said sleeve, substantially as described.

4. In a phonograph, the combination with a rotatable mandrel, of a mandrel shaft secured thereto to drive the same and extend-

ing therethrough, means connecting said mandrel to said shaft adjacent the outer end of the latter, a stationary sleeve surrounding said shaft and supporting said  
40 mandrel upon the exterior surface of said sleeve, said sleeve having a bore of greater diameter than the diameter of said shaft, and means exterior of said mandrel for supporting said sleeve, said sleeve being  
45 provided with a bearing surface at one end thereof within which said shaft is rotatably mounted, substantially as described.

5. In a phonograph, the combination with a rotatable mandrel having short bearing surfaces at the ends thereof, of a mandrel  
50 shaft secured thereto to drive the same and extending therethrough, means connecting said mandrel to said shaft adjacent the outer end of the latter, a stationary sleeve surrounding said shaft and engaged within  
55 said bearing surfaces to rotatably support said mandrel, said sleeve having a bore of greater diameter than the diameter of said shaft, and means exterior of said mandrel for supporting said sleeve, said sleeve being  
60 provided with a bearing surface at one end thereof within which said shaft is rotatably mounted, substantially as described.

This specification signed and witnessed this 29th day of July 1909.

CHARLES L. HIBBARD.

Witnesses:

JOHN M. CANFIELD,  
ANNA R. KLEHM.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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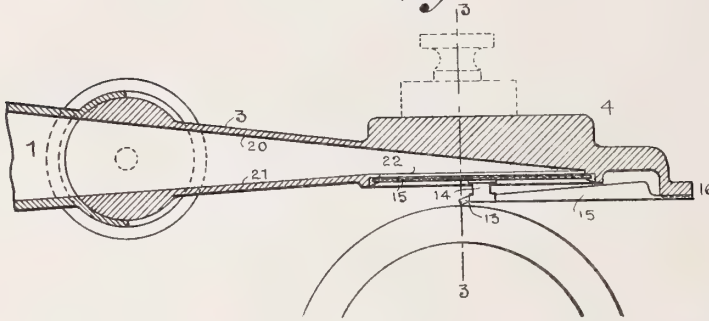


T. A. EDISON.  
 PHONOGRAPH DETERMINING DEVICE.  
 APPLICATION FILED JUNE 2, 1910.

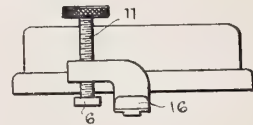
1,046,414.

Patented Dec. 3, 1912.

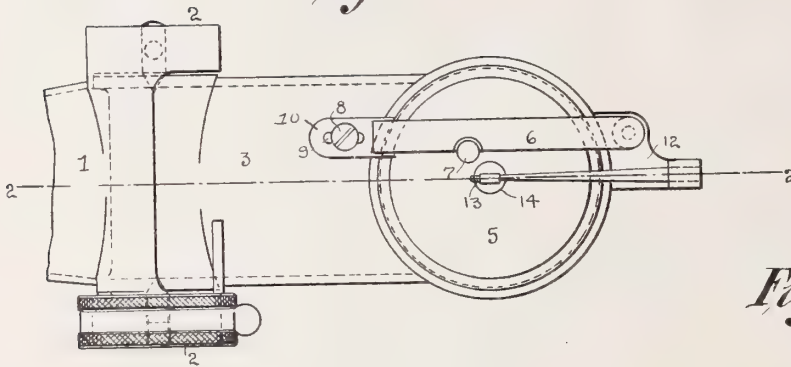
*Fig. 2*



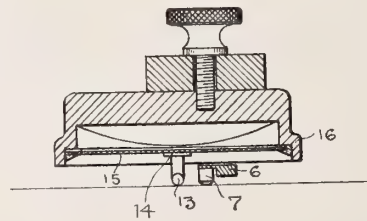
*Fig. 4*



*Fig. 1*



*Fig. 3*



*Witnesses:*

Robert M. Sutphen.  
 Dyer Smith

*Inventor:*

Thomas A. Edison  
 by Frank L. How  
 His Atty.

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, WEST ORANGE, NEW JERSEY, ASSIGNOR,  
BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE,  
NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH DETERMINING DEVICE.

1,046,414.

Specification of Letters Patent.

Patented Dec. 3, 1912.

Original application filed November 13, 1903, Serial No. 180,998. Divided and this application filed June 2, 1910. Serial No. 564,581.

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, West Orange, Essex county, New Jersey, have invented certain new and useful Improvements in Phonograph Determining Devices, of which the following is a description.

My invention relates to determining devices for phonographs or talking machines, this application being a division of my application Serial No. 180,998, filed November 13, 1903 for apparatus for recording sounds.

The object of my invention is to provide a device for supporting the body of a phonograph recorder upon the surface upon which a record is being made, and to provide suitable means for adjusting the relative position of the supporting device and the body of the recorder while the machine is in operation and the record surface is revolving.

The supporting device is preferably a ball of sapphire or other jewel. It is to be understood that the weight of the recorder is borne by this ball which rides upon the surface of the rotating record blank, the depth to which the recording stylus may enter the surface of the blank depending upon the maximum distance the stylus may project below the supporting ball. It is important in recording that the position of the supporting ball or determining device may be adjusted while the machine is running, since the depth of cut of the recording stylus may require adjustment during operation to conform to the varying conditions which may be met.

In order that my invention may be better understood, attention is directed to the accompanying drawings forming part of this specification, in which—

Figure 1 is a bottom plan view of a recorder showing the preferred form of my improved determining device. Fig. 2 is a sectional view thereof taken on line 2—2 of Fig. 1. Fig. 3 is a sectional view taken on line 3—3 of Fig. 2; and Fig. 4 is a front view of the body of the recorder.

In all of the above views, corresponding parts are represented by the same reference characters.

The hollow tube 1 which is connected to or is a continuation of the usual horn or

funnel is carried by the usual support, not shown, and has ears 2, 2, between which is pivoted the head or barrel 3. To the latter is secured the sound box or body 4 to the lower face of which is connected the diaphragm 5. Across the lower face of the body and below the diaphragm is the tracking lever 6 which serves as a support for the ball 7, which latter rests upon a record surface shown in Fig. 2 as a section of a cylinder and supports the body, allowing it to oscillate about the pivot between the ears 2, 2 and accommodate itself to all large irregularities in the surface of the blank. The ball 7 is of a comparatively small curvature, but is sufficient to permit universal adjustment and is preferably made of a jewel of which sapphire seems to be the best material, as it does not have any appreciable effect upon the record blank; furthermore, it is susceptible to taking a high polish so that its passage over the record will not scratch or otherwise injure the same.

The lever 6 is connected to one end of the body 4 by means of a screw 8 which passes through a slot 9 formed within an elastic extension 10 of the lever, whereby an elastic connection is formed so that the lever, together with the ball 7, may be adjusted in relation to the center of the diaphragm in a direction longitudinally of the lever and substantially parallel to the diaphragm. The other extremity of the lever engages with the adjusting screw 11 passing through a threaded opening in an extension 12 on the body and by means of which the relative position of the ball 7 and the body may be adjusted when the machine is running.

The knife or recording stylus 13 is attached to the diaphragm adjacent to its center and on the same line of travel as the ball 7 by means of a support or foot 14. The foot 14 is secured to the diaphragm by a suitable cement, such as melted shellac. The foot 14 may be connected to one end of an elastic reed 15, the other end of which is secured to a pillar 16 formed upon a continuation of the body 4. It will be understood that my invention is not limited to the exact construction shown, but that it comprises all equivalent constructions and is only limited by the appended claims.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:

1. In a recording device for recording  
5 sound waves, the combination with a body,  
of a diaphragm carried thereby, a lever hav-  
ing an elastic extension at one end, means  
securing said elastic extension to said body,  
a support carried by said lever adapted to  
10 engage the record, and means for adjusting  
the other end of said lever relative to said  
body, substantially as described.

2. In a recording device for recording  
sound waves, the combination with a body,  
15 of a diaphragm carried thereby, supporting  
means having an elastic connection with said  
body and adapted to engage the record, and  
means for adjusting the said supporting  
means relative to said body, substantially as  
20 described.

3. In a recording device for recording  
sound waves, the combination with a body,  
of a diaphragm carried thereby, supporting  
means having an elastic connection with said  
25 body and provided with a ball adapted to  
engage the record, and means for adjusting  
the said supporting means relative to said  
body, substantially as described.

4. In a recording device for recording  
30 sound waves, the combination with a body,  
of a diaphragm carried thereby, a lever hav-  
ing at one end an elastic connection with  
said body, a support carried by said lever  
and adapted to engage the record, and a  
35 screw mounted in a threaded opening in said  
body, the extremity of said screw engaging  
the other end of said lever for adjusting the  
position of the latter relative to said body,  
substantially as described.

40 5. In a recording device for recording  
sound waves, the combination with a body,

of a diaphragm carried thereby, a lever hav-  
ing at one end an adjustable connection with  
said body, said connection permitting lon-  
45 gitudinal adjustment of said lever, a sup-  
port carried by said lever and adapted to  
engage the record, and means for adjusting  
the other end of said lever relative to said  
body, substantially as described.

6. In a recording device for recording 50  
sound waves, the combination with a body,  
of a diaphragm carried thereby, a lever hav-  
ing at one end an adjustable elastic connec-  
tion with said body, a support carried by  
said lever and adapted to engage the record, 55  
and means for adjusting the other end of  
said lever relative to said body, substan-  
tially as described.

7. In a recording device for recording  
sound waves, the combination with a body, 60  
of a diaphragm carried thereby, a lever hav-  
ing an elastic slotted portion at one end, a  
screw passing through the slot in said lever  
for securing the latter to said body, a sup-  
65 port carried by said lever and adapted to en-  
gage the record, and means for adjusting the  
other end of said lever relative to said body.

8. In a device for recording sound waves,  
the combination with a body, of a dia-  
70 phragm carried thereby, a stylus connected  
with said diaphragm, and supporting means  
adapted to engage the record and having an  
adjustable connection with said body, said  
connection permitting adjustment of said  
75 supporting means substantially parallel to  
the diaphragm, substantially as described.

This specification signed and witnessed  
this 31st day of May 1910.

THOS. A. EDISON.

Witnesses:

DYER SMITH,

JOHN M. CANFIELD.



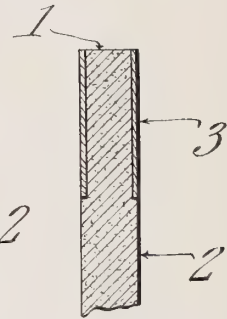
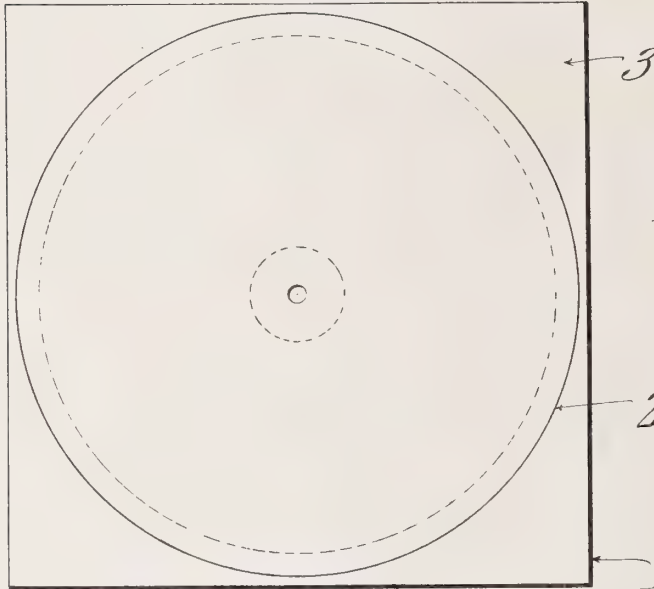


J. B. MOSES.  
SOUND RECORD TABLET.  
APPLICATION FILED NOV. 22, 1909.

1,046,418.

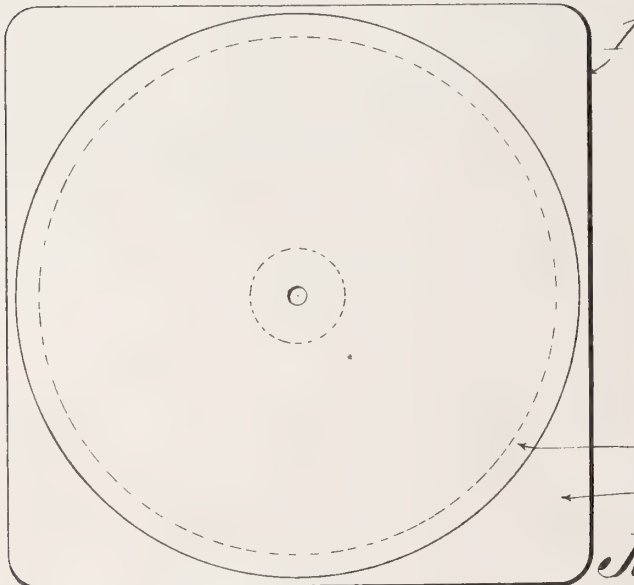
Patented Dec. 3, 1912.

*Fig. 1.*

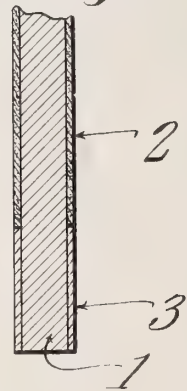


*Fig. 3.*

*Fig. 2.*



*Fig. 4.*



Inventor  
*Jacob B. Moses.*

Witnesses  
*E. J. Stewart*  
*F. J. Chapman*

By *C. A. Snow & Co.*  
Attorneys

# UNITED STATES PATENT OFFICE.

JACOB B. MOSES, OF DALLAS, TEXAS.

## SOUND-RECORD TABLET.

1,046,418.

Specification of Letters Patent.

Patented Dec. 3, 1912.

Original application filed August 7, 1909, Serial No. 511,804. Divided and this application filed November 22, 1909. Serial No. 529,370.

*To all whom it may concern:*

Be it known that I, JACOB B. MOSES, a citizen of the United States, residing at Dallas, in the county of Dallas and State of Texas, have invented a new and useful Sound-Record Tablet, of which the following is a specification.

This invention has reference to improvements in sound record tablets and is designed to provide a sound record tablet in which the sound grooves may be in the form of a volute and in which space for a label is provided without interfering with the extension of the volute groove close to the center of the tablet.

In accordance with the present invention the tablet is made substantially square, that is either with right angle corners or with rounded or cut-off corners while the record receiving surface on either one or both faces of the tablet, which latter is made thin and flat, is so disposed that all the space within a circle nearly or quite reaching the sides of the tablet may be utilized for the sound record groove while the label may be applied to or produced in the spaces between the outer edges of the sound record zone and the corners of the tablet. Such a tablet cannot roll when set on edge and the labels are more readily observable than when located within the inner turn of the sound record groove. The inner turns of the record groove may approach much closer to the axis of rotation of the tablet than is possible with the form of sound record tablet where the label is interior to the sound record groove zone. Such a form of sound record tablet is especially adapted to be lodged in a suitable case or cabinet or other holder, said tablets may be brought into close and parallel relation and by being arranged in spread count order the labels are readily visible at all times making it unnecessary to remove the tablets in order to observe the labels.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawings forming a part of this specification, in which drawings,

Figure 1 is a face view of a square sound record tablet made in accordance with the present invention showing the corners of right angle shape. Fig. 2 is a similar view showing the corners rounded. Fig. 3 is a detail section through a portion of a tablet

of one form. Fig. 4 is a detail section through a portion of a tablet of other construction than that shown in Fig. 3.

Referring to the drawings, there is shown a tablet 1 which is square in outline and is provided on one or both surfaces with a circular zone 2 designed to receive the sound record groove in the form of a spiral or volute, and preferably of the gramophone type. This tablet may be made in any of the many ways now known in the art so far as the composition of the tablet and the production of the sound record groove is concerned. The tablet may be made of solid or homogeneous sound record receiving material such as is commonly used for the circular type of sound record tablet, or any of the known forms of composite tablets may be employed. In the structures shown in Figs. 1 and 2 it is to be observed that the sound record receiving zone 2 is of less diameter than the distance between opposite sides of the tablet, but it will be understood that this zone may reach entirely to the sides of the tablet if so desired. The tablet is provided with a label 3 which may be in the form of a paper sheet equal in size to the tablet with the center punched out conformable to the sound record receiving zone 2, but when this zone reaches the opposite edges of the tablet then the label sections will simply fill the corners of the tablet, however since it is customary to extend the record material somewhat beyond the outer turns of the sound record groove, it is usually preferable to make the sound record receiving zone of somewhat less diameter than the distance between opposite sides of the tablet. The label or labels may be applied to the tablet when the latter is impressed with the sound record groove in the usual manner so that the labels become embedded in the material of the tablet and therefore are anchored therein and flush with the surface of the tablet. The labels will usually have the titles imprinted thereon and may also be provided with suitable spaces for filling in numbers and locations either in pencil or ink as the owner may desire.

In Fig. 1 the tablet is shown as square with right angle corners. In Fig. 2 the tablet is shown as provided with slightly rounded corners and this may be taken as indicative of any shape corners other than right

angle. Whatever the special form of the tablet may be, it is evident that generally the tablet is of square shape and the term "square" is to be understood as indicating a tablet where the corners are right angles or where the corners are rounded or otherwise shaped.

It is feasible to form a tablet with a fibrous body and apply the record receiving material in a circular zone such as indicated in Figs. 1 and 2 and the record groove will be impressed in this zone. Of course it will be understood that both sides of the tablet may be treated alike and record grooves may be impressed in both sides at once thus producing a double faced tablet like those commercially produced except that the body of the tablet is of square contour instead of round contour.

In Fig. 3 the body of the tablet is assumed to be made of homogeneous material with the label 3 embedded therein at the exterior of the sound groove receiving zone.

In Fig. 4 the body of the tablet is assumed to be made of some fibrous material with a film of record material applied to each face thereof to form the sound record receiving zone 2 and the label 3 is also applied to the body or under-structure of the tablet, the whole being united into one tablet under heat and pressure when the record groove is formed in the record receiving surface from a suitable matrix.

By placing the labels at the corners of the tablets instead of at the centers thereof, the titles of both sides of a double faced tablet may be displayed on each face so that the owner or user may see at a glance and without the necessity of reversing the tablet what the titles of both selections are and both titles may be produced upon each side of the tablet, and if desired at the four corners. Two corners may be used for the two titles of a double faced record and the other two corners may be used for advertising purposes or for such information as may be found desirable. Since there is no label about the axis of rotation of the tablet the sound record groove may be carried as close to the axis of rotation as may be found feasible and the closeness of approach of the inner turn of the record groove is not at all limited by the necessity of reserving space for a label.

The square form of tablet cannot roll if accidentally placed on edge or if purposely stored on edge and for any reason the support be inclined. A circular tablet will readily roll down an incline and is often broken

or marred by so rolling. Furthermore the square tablet may be laid flat upon a support and then moved to spread count position when the labels are readily observable and the tablet will maintain such position indefinitely. The square tablet will occupy no more space than a circular tablet and in view of the increased record receiving surface a longer record may be produced upon a square tablet than can be produced upon a circular tablet. Another advantage of the square record plate over one that is circular or of oblong contour is that it can be placed on the disk of the graphophone and taken off while the latter is in full motion, and this to users of a graphophone will prove a great convenience. Where the round record plate is used it is absolutely necessary to stop the disk of the graphophone from rotating before the record can be removed. It is also more or less difficult to position a round record on the disk while in motion. To stop the graphophone and start it again means a loss of time of from thirty to forty-five seconds, as it takes that length of time for the disk to attain the proper speed, and the result is an unnecessary loss of time which can be avoided by employing a square record.

To place a square record on the disk of the machine is a simple procedure, as there will be no trouble to gage the position of the record relatively to the stem at the center of the disk. To remove the record, it is only necessary to hold a finger, preferably the thumb, somewhere within the arc of the circle described by the points of the plate, and this of course will check its movement, and then it will be only necessary to take the corner between the thumb and finger and raise it from the disk, and this can readily be done while the disk is in full motion.

This application is a division of application Serial Number 511,804, filed by me on August 7, 1909, for improvements in sound record tablets and holder.

What is claimed is:

A record for graphophones, consisting of a square block of fibrous material, both faces of which are formed with record receiving depressions and disks of record material seated in said depressions.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JACOB B. MOSES.

Witnesses:

J. T. MAYFIELD,  
F. W. SCHAUB.



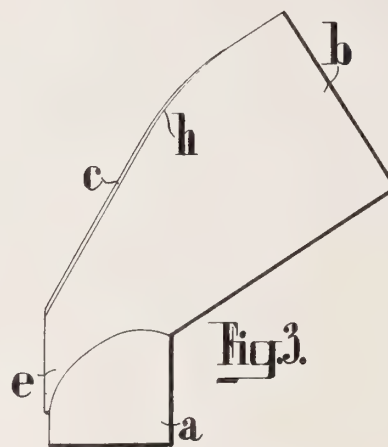
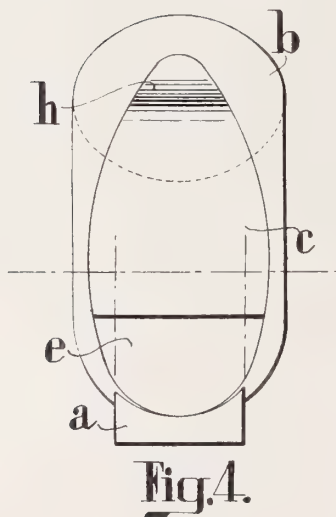
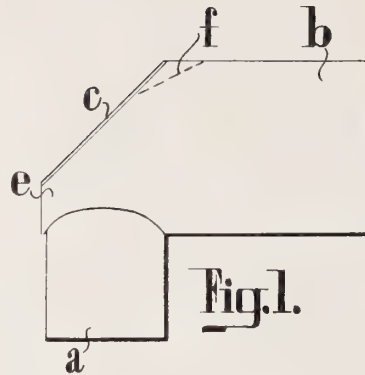
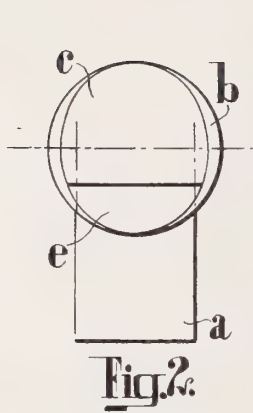




A. FISCHER.  
SOUND CONDUIT AND AMPLIFYING DEVICE.  
APPLICATION FILED JULY 24, 1911.

1,046,454.

Patented Dec. 10, 1912.



Witnesses.  
P. D. Franjou.  
C. F. Early.

Inventor.  
Alex. Fischer  
By his Attorneys.  
Baldwin & Wright

# UNITED STATES PATENT OFFICE.

ALEX FISCHER, OF KENSINGTON, LONDON, ENGLAND.

SOUND CONDUIT AND AMPLIFYING DEVICE.

1,046,454.

Specification of Letters Patent.

Patented Dec. 10, 1912.

Application filed July 24, 1911. Serial No. 640,259.

*To all whom it may concern:*

Be it known that I, ALEX FISCHER, a subject of the King of England, residing at 8 Maelise road, Kensington, London, England, have invented certain new and useful Improvements in Sound Conduits and Amplifying Devices; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to sound conduits and amplifying devices and refers to that class of such conduits and amplifying devices as are constructed with reflecting surfaces after the manner described in my application for Letters Patent Serial Number 555776, filed April 16, 1910, and more particularly to those in which no sectional area at right angles to the reflector is less than the area of the smaller tube, or in the case of circular tubes the vertical distance from the reflecting surface to the inner angular point where the two tubes join is approximately equal to the diameter of the smaller tube.

In applying the principle of my former aforesaid patent application to certain cases, in adapting it for instance to the receivers and transmitters of telephones, to speaking tubes, as well as to sound conduits of talking machines, certain phenomena became apparent. It was observed that when two tubes or sound conduits met at an angle and a reflector was provided, as described in the aforesaid application, if the reflector was only of sufficient size to include on its surface the projection of the smaller tube the sound waves were too much confined, while on the other hand if the reflector was of sufficient size to include on its surface the projection of the larger tube, the sound waves were allowed to spread out to an undesirable extent, and in each case the result was not so perfect as it can be made by carrying into effect the principle of my present invention.

According to the present invention, in place of making the reflector of sufficient size to include only the projection of the smaller tube or large enough to include that of the larger tube I make it intermediate in size. Then, supposing we have the tubes which are to be used as sound conduits and one of these tubes has a diameter of  $x$

millimeters, while the other has a diameter of  $(x+2y)$  mm. When these are connected together at a certain angle and a reflector is provided the projection of the smaller tube on the plane of the reflector is an ellipse with a minor axis  $x$  mm. in length. Again the projection of the larger tube on the same plane would give an ellipse with a minor axis of  $(x+2y)$  mm.

According to my present invention I select for the minor axis a length intermediate between the two, say  $(x+y)$  mm. This construction enables the waves to spread to a certain extent without giving them too much freedom, and produces surprisingly good results. It will be understood that the major axis of the ellipse and the general dimensions of the reflecting surface are correspondingly and suitably proportioned, and the end portions of the reflector, that is the portions representing the amounts by which the reflector exceeds toward the ends the ellipse forming the projection of the smaller tube, may be adjacent to one of the tubes or part may be adjacent to each of these tubes. These portions may be formed of one or more small plane reflectors set at suitable angles to catch and reflect the spreading waves, or, especially in the case of the larger tube, the auxiliary reflector may be curved in one direction so that the spreading waves impinging at slightly varying angles, due to their having emerged from the smaller tube, may nevertheless be reflected straight along the larger tube. And in order that this invention may be better understood, I will now proceed to describe the same with reference to the drawing accompanying this specification, which shows by way of example two methods of carrying my invention into effect.

Figure 1 is a side elevation of the junction of two sound conducting tubes. Fig. 2 is a back elevation of same. Fig. 3 is a similar view to Fig. 1 of another form. Fig. 4 is a similar view to Fig. 2.

The same letters of reference are employed to denote the same parts in all the views.

$a$  is the smaller tube the diameter of which is  $x$  mm.

$b$  is the larger tube the diameter of which is  $x+2y$  mm.

$c$  is the reflecting surface which is disposed so as to be equally inclined to the axis of each of the tubes  $a$  and  $b$  after the manner



described in my application above mentioned.

It will be observed that the minor axis of the reflector *c* is of such size that it comes  
 5 between the diameters of the smaller and larger tubes that is between  $x$  and  $(x+2y)$  mm. in this case about  $(x+y)$  mm. As the diameter of the larger tube is  $(x+2y)$  mm. and the minor axis of the reflector is only  
 10  $x+y$  it is clear that the surface of the larger tube must be curved inward somewhat in the neighborhood of the reflector in order to make a proper joint, and this may be done by cutting one or more small V-shaped  
 15 pieces out of the larger tube where the joint is to be effected and bending the ends in so that a suitable joint is made with the elliptical section in the neighborhood of the minor axis, or the same result may be obtained by  
 20 spinning or stamping up the metal. The reflector *c* may be carried right back so that the elliptical section is complete or it may be turned down as shown at *f* which prevents the sound from spreading backward.  
 25 When the device is in use the sound passing up the smaller tube *a* after leaving such tube tends to spread outward. The size of the reflector *c* is calculated so as to be just sufficient to receive the impinging sound  
 30 waves and to reflect them along the conduit *b* without there being any tendency for the sound waves to be compressed at the bend.

In some cases I prefer to make the construction such that a small extra plane reflector *f* shown dotted at Fig. 1 is placed  
 35 between the reflector *c* and the top of the tube *b*. The object of this construction is that the waves or a portion of the waves which are proceeding up the right hand  
 40 side of the tube *a* into the tube *b* not being confined by any walls tend to spread and therefore it is necessary to provide an extended surface for them to impinge upon  
 45 which surface must be at a suitable angle for reflecting them along the tube *b*.

Referring to the modified form shown at Figs. 3 and 4 in this case the general construction is the same, but in place of providing a plane reflector at *f*, I extend the  
 50 main reflector *c* so as to form a curved reflecting portion *h* substantially as shown in the drawing.

It will be understood that I may apply the  
 55 principle of this invention to bends of all kinds of sound conduits, for instance to transmitters of telephones, to megaphones, to speaking tubes, ear trumpets, sound conduits of talking machines and to all classes  
 60 of musical and acoustic instruments, and

that the methods of carrying out the invention may be varied to suit requirements of particular cases.

What I claim as my invention and desire to secure by Letters Patent of the United States of America is:—

1. A sound conduit or amplifying device comprising two tubes of different cross sectional areas meeting at an angle and a plane reflecting surface located at the junction of the tubes and equally inclined to the axes of the two tubes and in which no sectional area at right angles to the reflector is less than the area of the smaller tube, said reflecting surface being of such area that if the dimension of the small tube at right angles to the plane passing through the axes of the two tubes be  $x$  and the corresponding dimension of the large tube be  $y$  then the corresponding dimension of the plane reflecting surface shall be intermediate between  $x$  and  $y$ .

2. A sound conduit or amplifying device comprising two circular tubes of different diameters meeting at an angle and a plane reflecting surface located at the junction of the tubes and equally inclined to the axis of each tube and in which the vertical distance from the reflecting surface to the inner angular point where the two tubes join is approximately equal to the diameter of the smaller tube, said reflecting surface being of such area that the minor axis of the figure formed by the reflecting surface is intermediate in length between the diameters of the smaller and larger tubes for the purpose set forth.

3. A sound conduit or amplifying device, comprising two tubes of different cross sectional areas meeting at an angle and a reflecting surface located at the junction of the tubes and equally inclined to the axes of the two tubes and in which no sectional area at right angles to the reflector is less than the area of the smaller tube, said reflecting surface being of such area that if the dimension of the small tube at right angles to the plane passing through the axes of the two tubes be  $x$  and the corresponding dimension of the large tube be  $y$ , then the corresponding dimension of the reflecting surface shall be intermediate between  $x$  and  $y$ , said reflector having a relatively small reflecting surface set at an angle to it at that end next the larger tube.

In testimony whereof, I affix my signature, in presence of two witnesses.

ALEX FISCHER.

Witnesses:

LILY SIMMONDS,  
 A. E. VIDAL.

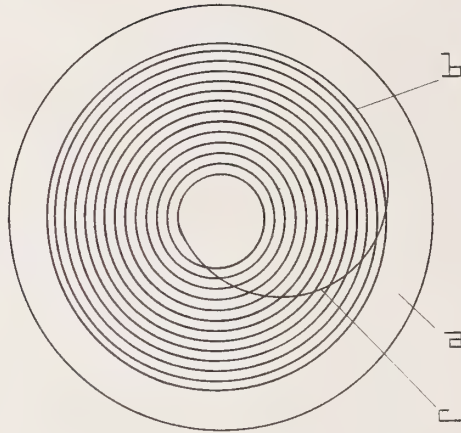




C. L. ROTHEUDT.  
GRAMOPHONE RECORD.  
APPLICATION FILED DEC. 26, 1911.

1,046,650.

Patented Dec. 10, 1912.



Witnesses:

*A. H. H. H.*  
*H. H. H.*

Inventor:

*Leonard*  
*Cornelius Rothardt*

# UNITED STATES PATENT OFFICE.

CORNELIUS LEONHARD ROTHEUDT, OF WALHEIM, NEAR AACHEN, GERMANY.

## GRAMOPHONE-RECORD.

1,046,650.

Specification of Letters Patent.

Patented Dec. 10, 1912.

Application filed December 26, 1911. Serial No. 667,896.

*To all whom it may concern:*

Be it known that I, CORNELIUS LEONHARD ROTHEUDT, a subject of the Emperor of Germany, residing at Walheim, near Aachen, Germany, have invented certain Improvements in Gramophone-Records, of which the following is a specification.

When it is desired to play a gramophone record several times in succession, the stylus must each time be lifted and transferred from one end of the record groove to the other, the play being meanwhile interrupted. This is of great disadvantage particularly when marches and dances are to be repeated which repetition ought to be obtained without noticeable interruption in the play. This drawback is remedied by the present invention according to which the groove of a gramophone disk is made endless, the ends of the record groove being joined by a return groove carried in a parabolic curve across the turns of said record groove. The direction of the curve is naturally dependent upon the direction in which the disk turns and its form should be such as to guide the stylus with as little resistance as possible. Having once been started in the direction of the return groove, the stylus is easily guided through the same, and the part of the groove which crosses the turns of the record groove can therefore be narrowed sufficiently for preventing it having a detrimental effect on the record. The in-

terruption caused to the music while the stylus passes through the return-groove will hardly be noticeable.

The invention is illustrated by way of example in the accompanying drawing by a plan of the improved gramophone disk.

In said drawings *a* is the disk and *b* the spiral groove which contains the record. The ends of the groove *b* are joined by the return groove *c* which is carried in a parabolic curve across the turns of the groove *b*.

The record is started in the ordinary manner, and the stylus is automatically returned by the groove *c* to the starting end of the groove *b* so as to repeat the piece as long as the disk is kept in motion.

I claim:—

1. A gramophone disk comprising a return groove carried across the turns of the record groove and connecting the ends of the latter so as to return the stylus automatically to its starting position, substantially as set forth.

2. A gramophone disk comprising a return groove carried in a parabolic curve across the turns of the record groove and connecting the ends of the latter so as to return the stylus automatically to its starting position, substantially as set forth.

CORNELIUS LEONHARD ROTHEUDT

Witnesses:

LOUIS VANDORY,  
THERESE THRANBEREND.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."



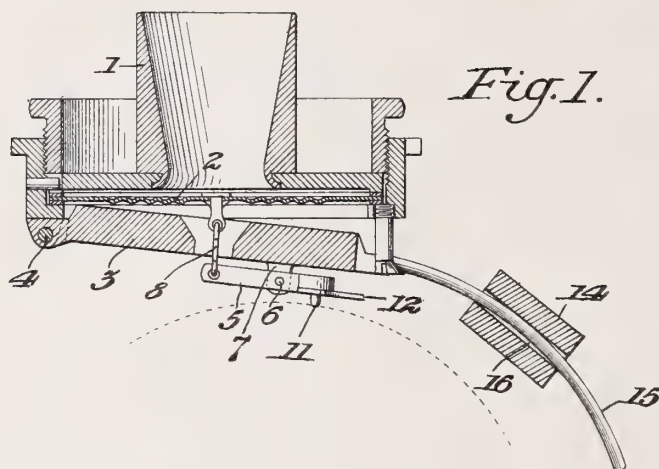




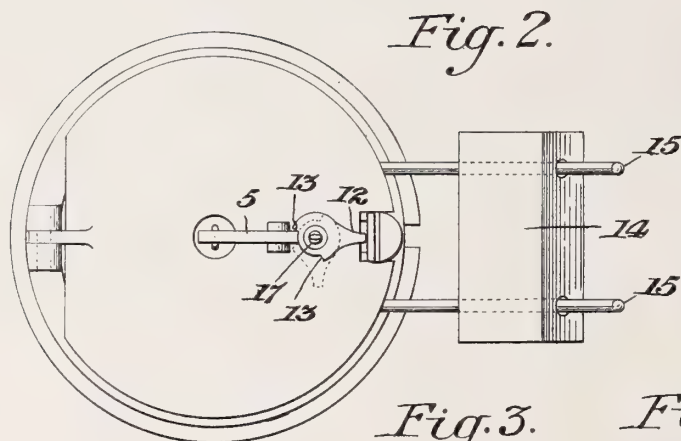
C. P. CARTER.  
TALKING MACHINE.  
APPLICATION FILED MAR. 1, 1909.

1,047,497.

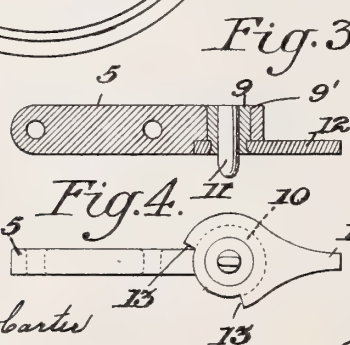
Patented Dec. 17, 1912.



*Fig. 1.*



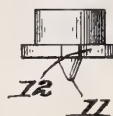
*Fig. 2.*



*Fig. 3.*

*Fig. 4.*

*Fig. 5.*



WITNESSES:

*Rachel S. Carter*  
*Harriet V. Carter.*

INVENTOR

*Charles P. Carter*

# UNITED STATES PATENT OFFICE.

CHARLES P. CARTER, OF KINGSTON, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## TALKING-MACHINE.

1,047,497.

Specification of Letters Patent.

Patented Dec. 17, 1912.

Application filed March 1, 1909. Serial No. 480,958.

*To all whom it may concern:*

Be it known that I, CHARLES P. CARTER, a citizen of the United States, and a resident of Kingston, in the county of Ulster and State of New York, have invented certain new and useful Improvements in Talking-Machines, of which the following is a description.

My invention relates to improvements in the sound reproducing mechanism of talking machines, and particularly to the stylus and mounting therefor.

It consists broadly in a single stylus adapted to track two different kinds of record grooves, as for example, record grooves having 100 threads per inch and record grooves having 200 threads per inch, as the grooves upon the so-called two-minute and four-minute cylindrical sound records. This is accomplished by forming the stylus of different contours in planes at right angles to each other, so that the stylus as viewed in one direction is narrower than when viewed in the direction at right angles thereto. A cross section of the stylus in one direction is of suitable size and form for tracking the 200 thread record grooves, for example, and its cross section in the other direction is of suitable size and form for tracking a record groove of different size and shape, as for example a 100 thread record groove. The stylus is mounted by any suitable means, which can be shifted through an angle preferably of 90 degrees, to permit the stylus to be used in a single reproducer comprising preferably a single diaphragm, a single floating weight, and a single stylus lever upon one end of which is mounted a holder for the stylus. This holder is rotatably mounted upon the lever. Upon moving the holder through an angle of 90 degrees, the stylus will be rotated to present a contour suitable for engaging a record groove having a different number of threads per inch from the record groove with which the stylus was adapted to coact before the rotation.

In order that the invention may be more fully understood, reference is made to the accompanying drawings of which—

Figure 1 is a central vertical section of a phonograph reproducer provided with and embodying my invention. Fig. 2 is a bottom plan view of the same. Fig. 3 is an

enlarged vertical section through the stylus lever, the stylus being shown in side elevation. Fig. 4 is a bottom plan view of the same, and Fig. 5 is an end view of the same.

In all of the views, the same reference characters will be used to denote corresponding parts.

The reproducer shown comprises a sound box body 1 of the usual form and a diaphragm 2 secured therein in the usual manner. The floating weight 3 is pivoted at 4 to the body of the reproducer, as shown, or in any desired and usual manner. Stylus lever 5 is pivotally secured at 6 to lugs 7 depending from floating weight 3. One end of lever 5 is connected to the center of diaphragm 2 by link 8 in the usual manner. Stylus holder 9 is rotatably mounted within the end of lever 5 opposite to link 8 in any suitable manner. In the construction shown, stylus holder 9 is rotatably mounted within an opening formed in the enlarged end portion 10 of lever 5, stylus 11 being secured centrally within holder 9 and extending below the same. A lever 12 is secured to or formed integral with holder 9. Preferably, lever 12 is mounted within a recess in the lower surface of enlarged portion 10 of lever 5, so that the lower face of lever 12 is flush with the lower surface of lever 5. Shoulders 13, 13 are formed upon lever 12 as shown, to abut against the ends of the recess in lever 5 in which member 12 is seated to limit the rotation of stylus holder 9 in each direction, shoulders 13, 13 being preferably so placed as to limit the rotation of the stylus holder to one of approximately an angle of 90 degrees.

Stylus 11 may be of any suitable material, such as sapphire, and is secured as by cement within the holder 9. The stylus when viewed in one direction presents a comparatively broad tracking surface, as in Fig. 3, and when viewed at right angles thereto, the stylus presents a comparatively narrow tracking surface, as shown in Fig. 5, which is a view of the stylus at right angles to the face thereof shown in Fig. 3. The stylus shown in Figs. 3 and 5 is in position for tracking a 200 thread record groove, and if handle 12 be turned through an angle of 90 degrees, the broad face of the stylus shown in Fig. 3 will be moved into the position at

right angles thereto shown in Fig. 5, to track a 100 thread record groove. The stylus 11 may conveniently be shaped by first grinding to the shape shown in Fig. 3, and then grinding off the same on opposite sides to form the narrow point shown in Fig. 5, the sapphire then being highly polished. After stylus holder 9 is positioned within stylus lever 5, it may be peened within the same as shown at 9' to rotatably hold the same within the stylus lever, or the stylus holder 9 may be rotatably mounted within the stylus lever in any other desired manner.

I prefer to use an additional adjustable weight mounted upon floating weight 3 as shown at 14. Floating weight 3 is preferably provided with two curved arms extending forwardly and downwardly from the forward end thereof, as shown, upon which is mounted weight 14, which is provided with straight passages 16 there-through by which the same is mounted upon curved rods 15. Weight 14 may be shifted forward or back upon members 16 to create greater or less pressure upon stylus 11, as desired. Because of the curvature of members 15, weight 14 may be bound in position at any desired point.

Having now described my invention, what I claim and desire to secure by Letters Patent is:—

1. A phonograph reproducer comprising a stylus, the cross-section of which in one plane is substantially narrower than in a plane at an angle thereto, and a mounting for said stylus rotatable through said angle to enable the stylus to engage record grooves of different size or shape.

2. A phonograph reproducer comprising a stylus lever, a stylus holder having an angular adjustment with respect to said lever, and a stylus carried by said holder and having different contours in planes at an angle to each other to enable it to engage record grooves of different size or shape.

3. A phonograph reproducer comprising a body, a floating weight pivoted thereto, a stylus lever pivoted to said floating weight, a stylus holder mounted upon said lever and having an angular adjustment with respect thereto, and a stylus carried by said holder and having different contours in planes at an angle to each other to enable it to engage record grooves of different size or shape.

4. A phonograph reproducer comprising a stylus lever, a stylus holder carried by said lever and angularly adjustable with reference to said lever, a stylus fixed in said holder having operative record engaging surfaces having different contours in planes at an angle to each other, means for adjusting said holder angularly to position the one or the other of said surfaces in operative position, and means for stopping said holder in its different operative positions.

5. In a device of the class described, the combination of a stylus, the cross-section of which in one plane is substantially narrower than in a plane at an angle thereto, and a mounting for said stylus permitting rotation of the stylus through an angle to enable the stylus to engage record grooves of different size or shape.

CHARLES P. CARTER.

Witnesses:

RACHEL S. CARTER,  
HARRIET V. CARTER.

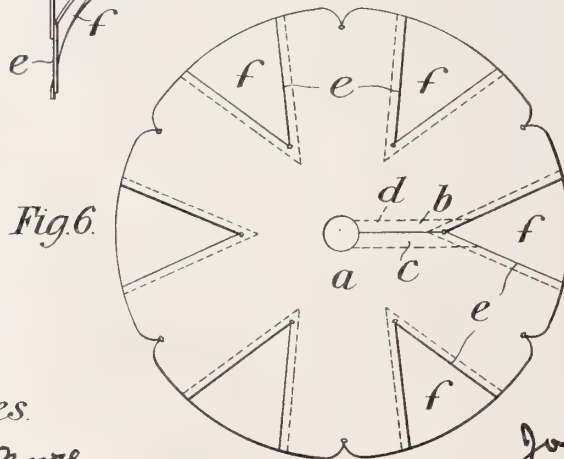
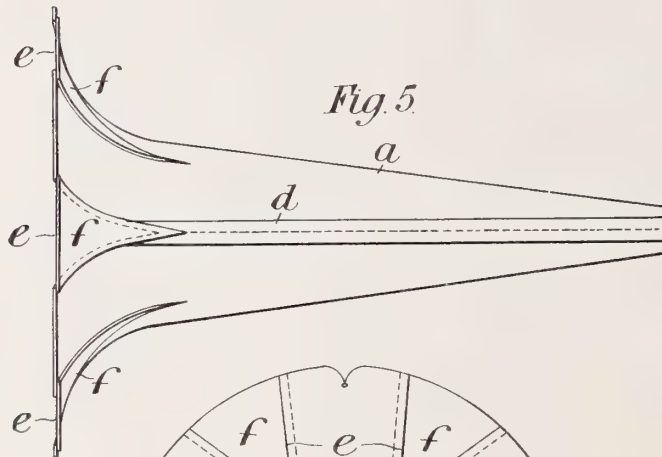
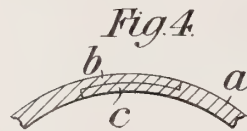
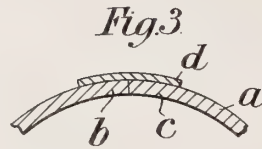
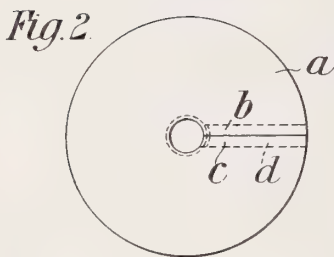
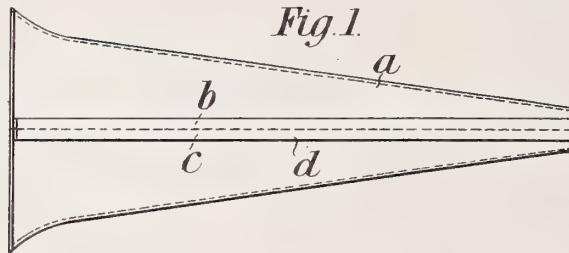




J. GREEN.  
GRAMOPHONE, PHONOGRAPH, AND LIKE HORN.  
APPLICATION FILED FEB. 13, 1911.

1,047,789.

Patented Dec. 17, 1912.



Witnesses.

J. K. Moore  
R. E. Barry.

Inventor.

Joshua Green  
Whitaker & Treadwell,  
attys.

# UNITED STATES PATENT OFFICE.

JOSHUA GREEN, OF LONDON, ENGLAND.

GRAMOPHONE, PHONOGRAPH, AND LIKE HORN.

1,047,789.

Specification of Letters Patent.

Patented Dec. 17, 1912.

Application filed February 13, 1911. Serial No. 608,255.

*To all whom it may concern:*

Be it known that I, JOSHUA GREEN, a subject of the King of Great Britain, residing at 27 Pyrland road, Canonbury, London, England, have invented new and useful Improvements in Gramophone, Phonograph, and Like Horns, of which the following is a specification.

My invention relates to the manufacture of horns for gramophones, phonographs and the like. Such horns are in practice usually made of metal, such as tin, or of wood, and in the latter case are built up of sections or strips, the edges of the adjacent strips being connected together so as to form a complete horn. This construction, however, is costly.

Now, my invention has for its object to provide means whereby such wooden horns, which, for various reasons are preferred to the tin horns, can be manufactured at a considerably less cost than has hitherto been possible. To this end, according to my invention I make a horn from a single blank of wood which is shaped to the usual conformation and is connected together at the two adjoining edges.

In carrying out my invention I advantageously proceed as follows, that is to say, I take a blank of ply-wood, and I subject the same to a dry heat, the heat being continued until the wood becomes pliable and can be worked on a mold of the shape of the horn to be produced. In practice I may make use of a hollow metal mold which is internally heated in any suitable way, say, for example, by the passage therethrough of the gases of combustion from a fire or furnace, or of steam. The ply-wood from which the horn is to be made is applied to the said heated mold and is gradually caused to assume the shape of the finished horn. To connect the abutting edges of the bent blank forming the horn, I may, for example, make use of a butt strip, or I may halve the edges and connect them together or I may connect them in any other well known way.

In the case of horns in which the bell-mouth or flared end is of marked dimensions some difficulty may be experienced in the molding and I may, therefore, make the extremity of the strip which is to form the said bell-mouth or flared end with a series of slits which permit the said extremity to be opened out or flared to the extent desired. The wedge or other shaped spaces which are formed by the slits when the extremity is

thus opened out may be filled up in any convenient way. For example, separate pieces of wood may be filled in the said spaces or a strip or strips of wood may be applied circumferentially around the inner or the outer surface of the horn at the slit extremity.

In practice the insertions or portions of wood applied to the flared end or bell-mouth of the horn may be of different colors thus giving rise to artistic effects of a kind which may be varied as desired.

To enable the invention to be fully understood, I will describe it by reference to the accompanying drawing, in which:—

Figure 1 is a side view of a horn molded from a single blank of wood according to my invention. Fig. 2 is a front view thereof. Fig. 3 is a transverse section of the joint between the edges of the wooden blank forming the horn and drawn to a larger scale. Fig. 4 is a view similar to Fig. 3, but illustrating a modified form of joint, and Figs. 5 and 6 are views similar to Figs. 1 and 2 respectively of the modified construction of horn.

Referring first to the construction of horn illustrated in Figs. 1 to 3, *a* represents the single blank of ply-wood which wood is molded to the shape indicated by being subjected to a dry heat which is continued as above described until the wood becomes sufficiently pliable to permit of its being molded to the desired shape. Any suitable apparatus may be made use of for molding the wood such as a hollow metal mold internally heated by steam or other gas or vapor. It is necessary that the ply-wood, to stand this treatment should be specially pliable. I have found that three-ply wood made of alder, the outer layers being  $\frac{3}{4}$  millimeter in thickness and the inner layer  $\frac{1}{2}$  millimeter is sufficiently pliable. It is to be understood that in the ply-wood employed by me, as in all ply-wood, the grain of each layer is disposed across the grain of adjacent layers.

The two meeting or abutting edges *b*, *c*, of the molded blank *a* forming the horn are connected together by means of the joint strip *d* which is applied externally to the horn as illustrated. Or, the joint may be made as indicated in Fig. 4, that is to say, by halving the meeting edges *b* and *c*.

Figs. 5 and 6 illustrate a horn in which the flaring end of the molded strip *a* is formed with slits or cut away portions *e*, the spaces thus formed when the flared end

is molded being filled up by the separate pieces of wood *f*, *f* which are applied around the outer or inner periphery of the horns; in the construction illustrated the  
5 said pieces *f* are applied externally.

As above stated the pieces *f* may be composed of wood of a different color from that forming the body *a* of the horn, thus giving rise to varied artistic effects.

10 Claims.

1. As a new article of manufacture, an amplifying horn for gramophones and the like, consisting of a single integral piece of previously prepared ply-wood, and having  
15 its meeting edges united to form a single seam extending longitudinally of the horn.

2. As a new article of manufacture, an amplifying horn for gramophones and the like, consisting of a single integral piece of previously prepared ply-wood, and having  
20 its meeting edges united to form a single seam extending longitudinally of the horn, the marginal portions at the larger end of the horn being split and the integral pieces  
25 so formed being spread apart, and separate pieces secured to said separated integral pieces to close the apertures formed between them and complete the bell of the horn.

JOSHUA GREEN.

Witnesses:

JOHN E. BOUSFIELD,  
A. ALBUTT.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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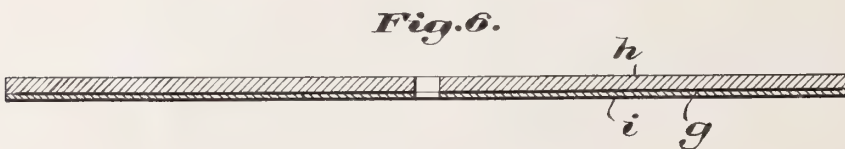
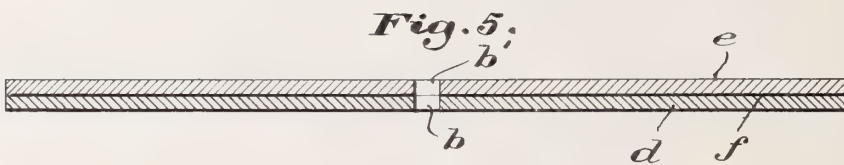
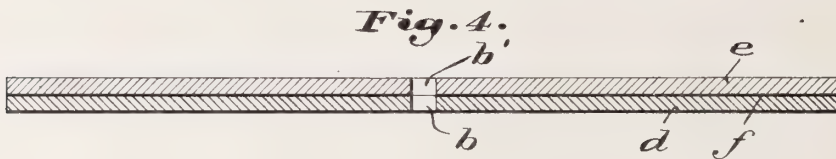
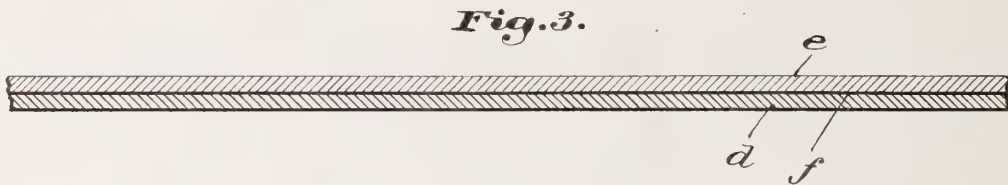
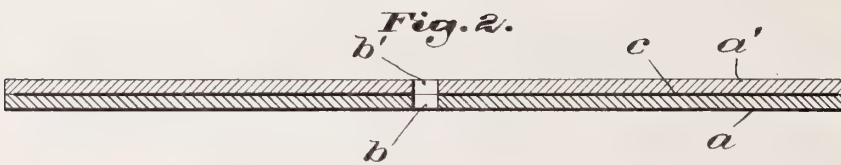
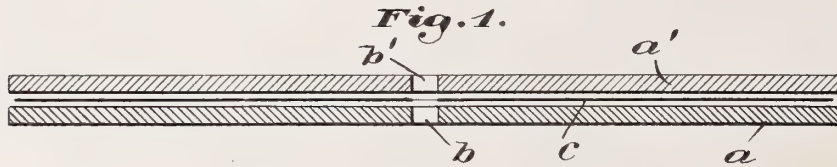




J. B. MILLET.  
 PHONOGRAPH RECORD.  
 APPLICATION FILED JAN. 5, 1911.

1,047,971.

Patented Dec. 24, 1912.



**Witnesses:**

*Ernest A. Telfer*  
*Carl L. Choate*

**Inventor:**

*Josiah B. Millet*  
 by *Emory Booth Jimmy Varney*  
**Attys.**

# UNITED STATES PATENT OFFICE.

JOSIAH B. MILLET, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO BOSTON TALKING MACHINE COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MAINE.

## PHONOGRAPH-RECORD.

1,047,971.

Specification of Letters Patent.

Patented Dec. 24, 1912.

Application filed January 5, 1911. Serial No. 600,902.

### *To all whom it may concern:*

Be it known that I, JOSIAH B. MILLET, a citizen of the United States, and a resident of Boston, county of Suffolk, State of Massachusetts, whose post-office address is 120 Boylston street, Boston, Massachusetts, have invented an Improvement in Phonograph-Records, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to phonograph records and more particularly though not exclusively to records in disk form.

The invention will be best understood by reference to the following description when taken in connection with the accompanying illustration of one or more specific embodiments thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings: Figure 1 shows the component parts of a disk record embodying one form of my invention in the condition in which such parts are prior to pressing; Fig. 2 shows the complete record after pressing; Fig. 3 shows in cross section a portion of composition sheet material from which a record made according to one form of the invention may be formed; Fig. 4 shows a disk formed from such material prior to pressing; Fig. 5 shows a completed record after pressing; and Fig. 6 shows a modified form of record.

Referring to the drawings and first to the embodiment of my invention shown in Figs. 1 and 2, I have there illustrated one form of record consisting of a superior type of double-faced record disk having sound grooves of varying depth, that is to say, of the so-called hill and valley type.

In the production of double-faced record disks it has heretofore been the common practice to use a homogeneous body of plastic record material with the sound grooves on opposite faces pressed into one and the same mass of material. Such a double-faced record disk is described in patent to Petit No. 749,092, where it is stated that the simultaneous pressure by the opposing matrices in the die under similar conditions and in one and the same homogeneous mass of plastic material insures uniformity in the

flow of the said material at both faces of the disk.

I have found that in the case of double-faced records and especially those having sound grooves with vertical undulations or of varying depth, the best results are obtained by avoiding the use of a homogeneous or continuous mass of plastic material.

One feature of my invention consists in so dividing or separating the plastic material presented to one matrix from the plastic material presented to the other matrix that instead of securing a common uniform displacement at both sides of the same undivided intermediate plastic mass under the action of the two opposing matrices, the displacement or flow of the one mass facing the one matrix takes place independently of the flow or displacement of the separated mass facing the opposite matrix.

The quality of a sound record is largely dependent upon the density and uniformity of the record material in and about the record groove. In the case of records of the degree of thinness commercially employed, if a single homogeneous mass of material is used the displacement of material under one matrix appears to interfere with or modify the free displacement of material under the opposing matrix, so that there tends to result a variation and inferiority in the quality of the record which seems to be due to a variation in the density of the material under different portions of the sound groove. This is caused, as I apprehend, by the fact that the varying and irregular projections on the face of one matrix acting on the thin homogeneous intermediate layer of plastic material so modifies the movement of such material that the freedom and facility with which the material at the bottom of the groove adapts itself to such varying and irregular projections on the face of the opposing matrix is impaired. In other words, notwithstanding that a differential or non-uniform flow at opposite sides should be permitted, a uniformity of flow is enforced by this process, which flow is the resultant of the two displacements at the two opposite faces. This is the case with records having sound grooves provided with lateral undulations as well as those having sound grooves provided with vertical undulations,



although in the latter case the interference between the displacement of material at one side and the displacement of material at the opposite side seems more directly to impair the quality of the record.

I have found that the interposition of a separator acting as a partition between the material presented to one matrix and the material presented to the other, and thereby interrupting the continuity and homogeneity of the material will separate the plastic mass for purposes of flow and displacement into two distinct bodies so that, while the pressure of one matrix is transmitted from one mass through the separator to the other mass, and the said matrix is thereby effective in pressing the material into the irregular projections of the opposing matrix in just the same way that the smooth faced platen is effective in pressing a single faced record, nevertheless the displacement or flow of plastic material under and about the projections of such matrix is free and unimpaired and independent of the displacement or flow of the separated mass of material under and about the projections of said opposing matrix, and vice versa.

While the thickness of the separator is in a sense quite immaterial so long as it does not amount to what might be termed a backing, it is preferable that it be made as thin as possible and form as small a part of the mass of the record as is consistent with the separation of the two bodies of plastic material as regards independence of flow in the plastic state when in the press and under the action of the two matrices. Nor is it essential, though ordinarily preferable, that the separator consist of an impervious or impenetrable division wall, for a coarsely fabricated, porous or meshed material might suffice under suitable conditions to separate the flow of plastic material on the two sides of the disk and allow one to take place independently of the other.

Any suitable material may be employed for the separator, but good results are obtained by using a sheet of paper, preferably thin, tough and smooth. The thickness need not exceed one one-hundredth of an inch, or less. Thin bond paper seven or eight thousandths of an inch thick will serve the purpose.

I am aware that disk records have been made composed in part of pasteboard sheets or the like, but in such cases such material has been in the form of a backing or foundation body and the object has been to strengthen the structure of the record by the addition of a large mass of cellular material or to cheapen the cost of production by substituting for the inner body portion of the record a relatively large amount of cheaper material for the more expensive plastic material. In such cases a large or

the largest part of the mass of the record has been composed of the pasteboard or other cellular material used and the plastic record receiving material has been applied thereto in the form of a thin surface film.

The best results, however, in the case of sound grooves having vertical undulations are only obtained where there is provided a relatively large mass of the plastic record-receiving material under the sound groove to act as a body or foundation therefor, such foundation materially improving the tone and the resonant quality of the record. By providing a thin paper or other separating wall between the two bodies of plastic material, to serve, not as a backing or foundation for the record, but as a mere partition, the total mass of plastic material is not appreciably or harmfully diminished and each record groove has substantially the requisite underlying foundation or body of record-receiving material to maintain the tone and quality of the record.

The resonant qualities of the disk may in fact be improved by a judicious selection of the material of which the separator is composed, while still leaving the major body of the disk composed of plastic record material. I have found that a thin layer of porous paper, such for example, as thin blotting paper will act as a separator and at the same time improve the resonant qualities of the disk, or two very thin layers of wood glued together with the grain arranged at right angles to prevent splitting, will serve as a resonant separator.

The separation of the record into two parts by the thin separator not only improves a record and particularly one of the hill and valley type, for the reasons stated, while giving it all the tone quality which a solid homogeneous record possesses due to the presence of a relatively large body of record material at and under the sound groove, but the separation of the record into distinct laminae or layers, apart from any structural strength residing in the separator itself, materially improves the structure of the record by diminishing the brittleness thereof and reducing the likelihood of breakage.

In forming a disk record in accordance with my invention any suitable plastic material may be employed, but ordinarily such material will comprise the customary and well known mixture of shellac and china clay or other infusorial earth or any suitable variation thereof known as gramophone record material. Such material may be applied to the upturned face of the underlying matrix in the form of a lump, a separator being placed on top of the said lump and then another lump of the plastic material upon the separator, the composite mass being thereupon subjected to the action of the press. Preferably, however, I previously

shape the plastic material by punching or cutting so that it has the form of disks of uniform thickness, or the approximate form of disks of uniform thickness. Such a disk is represented at *a* in Fig. 1 being perforated at *b* to receive the centering pin of the matrix. The parts in Fig. 1 as well as in the remaining figures of the drawings are shown of exaggerated thickness for the sake of clearness. Such disk preferably has a thickness about or somewhat greater than half the thickness of the finished record, for example about one thirty-second of an inch. This disk being placed upon the centering pin and upon the lower matrix, a centrally perforated disk *c* of thin paper is placed upon it and on top of the paper is then placed a second disk *a'* of plastic material similar to the disk *a*. This composite disk being then subjected to the action of the press, the upper and lower matrices will leave their imprints in opposing faces of the record, the separator *c*, however, preserving the required independence of flow or displacement as between the separate masses of plastic material on opposite sides thereof as has been more fully referred to above.

The completed record shown in Fig. 2 will comprise two solid layers of record material each of sufficient mass to give the requisite tone quality, such layers, however, being separated by the paper separator and being much less brittle than a solid record.

The paper disk *c* may be co-extensive with the disks *a* and *a'*, or may be much smaller in diameter, while still maintaining the desired independence in flow. Preferably, however, while extending beyond the limits of the sound record groove the said paper disk has its diameter somewhat less than that of the disks *a* and *a'*, so that the edges of the said paper will be slightly embedded in or coated by the material of the finished record as represented in Fig. 2 and therefore invisible. This may not always be necessary as the compression of the mass of the record will necessarily force the material over the edges of the paper.

If, desired, a single composite disk provided with its separator may be previously formed before the sound groove or grooves are pressed into its faces, such previously prepared disk consisting of an upper and lower layer of plastic material with an intervening separator. This can be done by rolling out the material into sheet form under heated rolls. A fragment of such material is represented in Fig. 3, this consisting of a continuous lower layer of plastic material *d* of the required thickness, an upper layer *e* of substantially the same thickness and a relatively thin intervening paper sheet *f*. From such sheet material a perforated disk such as is shown in Fig. 4 can be punched out, and this being placed in the press may

receive the impression of the sound grooves therefrom, forming the completed disk represented in Fig. 5.

In the usual process of pressing records where no separator is employed the free displacement and flow of the plastic material, which is ordinarily heavily charged with clay or other gritty matter, results in excessive frictional wear upon the matrices, necessitating their frequent renewal. The use of the separator, while leaving the material free to conform to the contour of the matrix, lessens the total aggregate displacement of the material toward the sides of the disk and saves a corresponding amount of wear upon the matrix. The excessive flow of material toward the sides of the disk moreover, and therefore the wear upon the matrix, is materially reduced by the previous preparation of the plastic material in sheet and disk form, or approximate disk form, as described, prior to the pressing action, the final pressing action being relied upon merely to impress the record groove into the material and slightly compress the disk as incidental to its operation.

The subdivision of the disk into layers reduces the liability to breakage, and the thinness of the record may therefore be reduced and the amount of plastic material may be cut down to the minimum amount which is required to give the desired tone and resonant quality.

The formation of the disk in the manner described permits the utilization at opposite faces thereof of masses of record receiving material having distinctly different characteristics, but each best adapted to receive the imprint of the particular kind of sound groove intended to be impressed therein. For example, the disk *a* in Fig. 1 may be composed of shellac mixed with a large proportion of clay and have impressed therein a record groove of a brass band, while the opposite disk *a'* may be composed of shellac charged with celluloid or other ingredients intended to provide a smoother surface and more effective groove for a soprano solo, violin or string quartet. This sub-division of the disk furthermore permits the employment of separate and opposite masses of plastic material contrasted by way of color or otherwise. For example, by the use of suitable pigments the material on one side of the separator may be colored blue and the material on the opposite side of the separator red, green, or some contrasting color other than blue. This makes it possible to distinguish at a glance which side of the disk is uppermost and when employed in connection with a system of impressing one class of pieces, for example, band music, into material of one color, and another class of pieces, for example, vocal music, into the material of another color, affords means for



readily identifying the character of the record which is uppermost.

In Fig. 6 I have shown another form of disk record where a thin paper partition *g* is provided which serves to separate the relatively thick mass *h* of plastic material which may have the same composition as in the case of the disk *a'* in Fig. 1, from a second body of material *i* which herein is thinner than the layer *h* and may consist of celluloid, or celluloid with other ingredients such as shellac with a small proportion of crocus powder, intended to give a smoother surface so that that side of the disk may be fitted to receive record grooves of pieces requiring for their best reproduction such a character of surface. The celluloid may be applied in sheet form and if so, being of lesser plasticity than the material *h*, the paper sheet *g* may then be omitted.

It will be obvious that my invention, while especially advantageous as to some of its features to double disk records, is not limited to disk records having sound grooves on both faces thereof nor alone to records provided with grooves having vertical undulations, but that as to certain of its features it is applicable to records having sound grooves provided with lateral undulations and to single record disks as well as to records having a cylindrical form.

While, for purposes of illustration, I have herein shown and described one specific form of my invention, it is to be understood that the same is not limited to the details herein described, but these may be varied within wide limits without departing from the spirit thereof.

#### Claims:

1. A molded sound record comprising a sheet of paper and resinous thermo-plastic record-material on either side of said paper, the whole pressed into an adherent mass,

the thermo-plastic record-material being sufficiently thick to render the record rigid and resonant and the paper sufficiently thin to flex to the irregularities of the interior surface of the plastic material.

2. A molded sound record comprising a thin separating sheet of flexible material and resinous thermo-plastic record material on either side of said separating sheet, the whole pressed into an adherent mass, the thermo-plastic record material being sufficiently thick to render the record rigid and resonant, and the separating sheet sufficiently thin to flex to the irregularities of the interior surface of the plastic material.

3. A molded sound record comprising a thin sheet of fibrous material and resinous thermo-plastic record material on either side of said fibrous material, the whole pressed into an adherent mass, the thermo-plastic record material being sufficiently thick to render the record rigid and resonant, and the fibrous material sufficiently thin to flex to the irregularities of the interior surface of the plastic material.

4. A molded sound record comprising a thin sheet of fibrous material and plastic record material on either side of said fibrous material, the whole pressed while said record material is in a substantially uniform semi-fluid state into an adherent mass, the plastic record material being sufficiently thick to render the record rigid and resonant, and the fibrous material sufficiently thin to flex to the irregularities of the interior surface of the plastic material.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JOSIAH B. MILLET.

Witnesses:

EVERETT S. EMERY,  
THOMAS B. BOOTH.

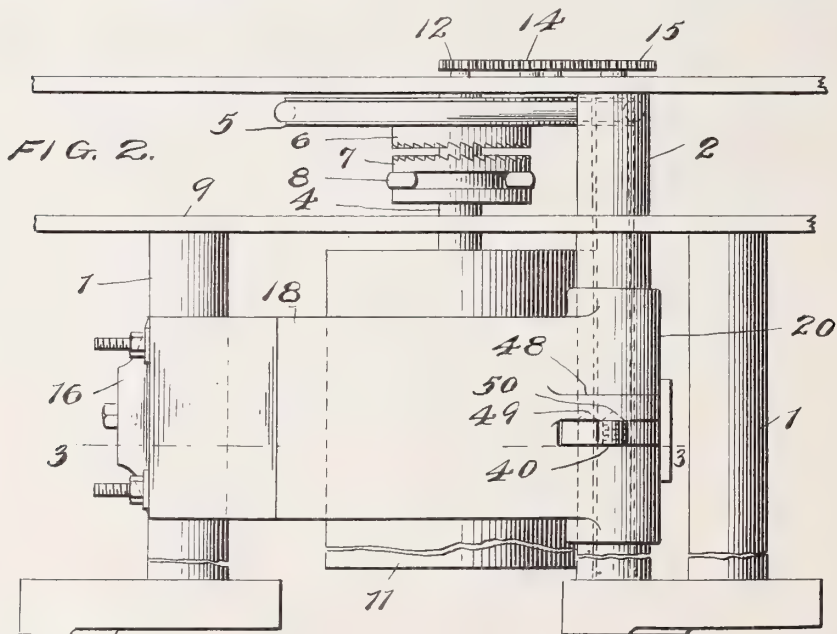
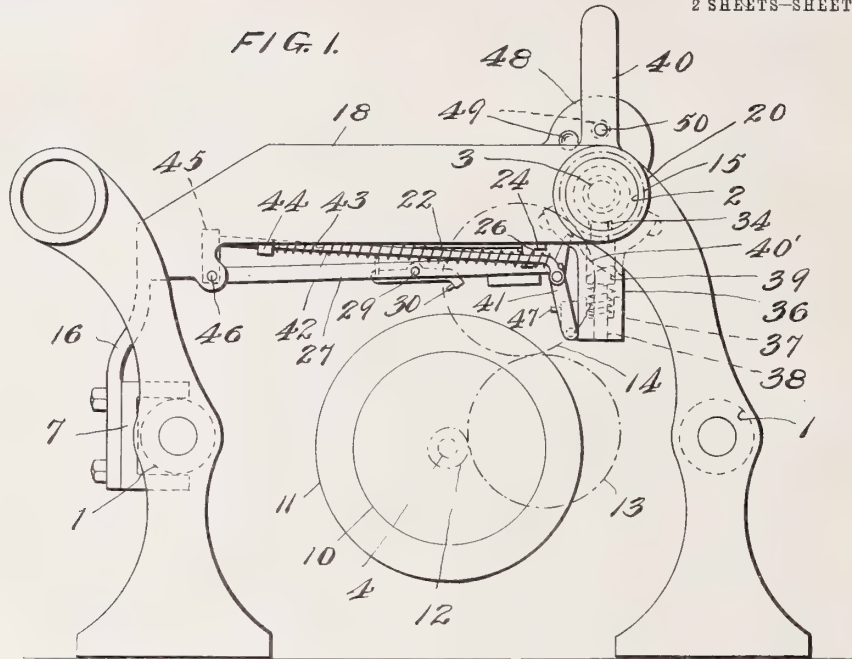


J. NOLL.  
SOUND RECORDING APPARATUS.  
APPLICATION FILED JUNE 21, 1911.

1,047,976.

Patented Dec. 24, 1912.

2 SHEETS—SHEET 1.



WITNESSES

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SOUND RECORDING APPARATUS.  
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2 SHEETS—SHEET 2.

FIG. 3.

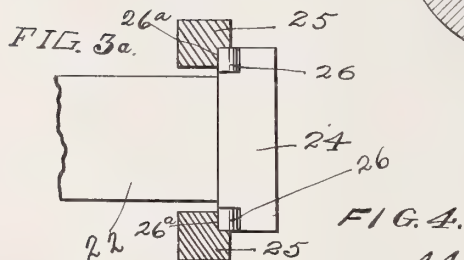
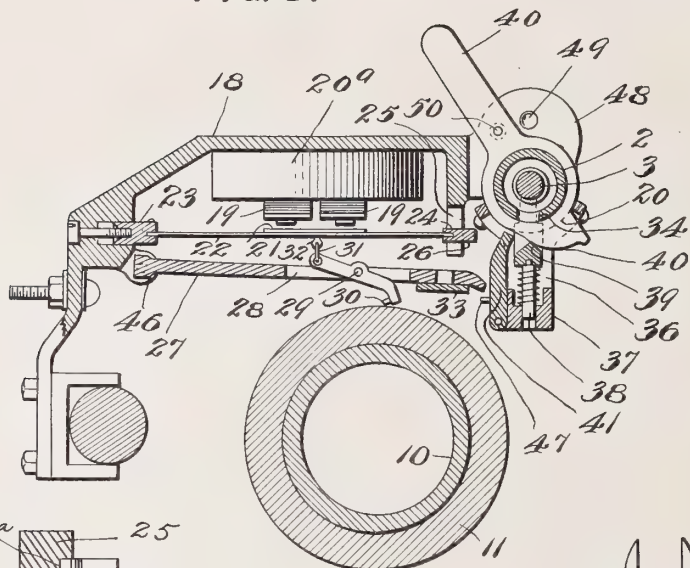
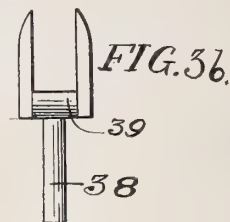
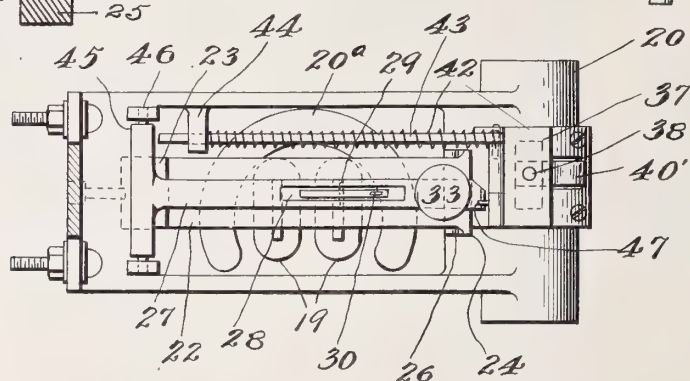


FIG. 4.



WITNESSES

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C. L. Parker

Attorney

# UNITED STATES PATENT OFFICE.

JOHN NOLL, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO EUGENE DEL MAR, OF NEW YORK, N. Y.

## SOUND-RECORDING APPARATUS.

1,047,976.

Specification of Letters Patent.

Patented Dec. 24, 1912.

Application filed June 21, 1911. Serial No. 634,522.

*To all whom it may concern:*

Be it known that I, JOHN NOLL, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Sound-Recording Apparatus, of which the following is a specification.

This invention comprises new means for effecting a talking machine record of speech or sounds and is particularly adapted to the making of records of telephonically transmitted speech. The term talking machine is used broadly, the particular type illustrated herein being that in which the record is made in a circumferential spiral line upon a cylinder, as of wax or other appropriate material. The organization comprises, among other things, a stylus lever operated by vibrations of a medium such as a stretched metal band actuated electromagnetically in the case of telephonically transmitted sounds, said stylus lever having a floating fulcrum through which an adequate gravity stress, capable of adjustment if desired, may be imposed upon the recording stylus bearing upon the record receiving surface.

In the accompanying drawings: Figure 1 is an end elevation; Fig. 2, a plan view; Fig. 3, a section on the line 3, 3, of Fig. 2; Fig. 3<sup>a</sup> is a detail horizontal section taken slightly above the stretched metal band and through means for holding one end of the same, parts being shown in elevation; Fig. 3<sup>b</sup> is a side elevation of the post which engages the feed-screw; and Fig. 4, a bottom plan view of the recording devices.

As shown the apparatus comprises an appropriate frame supporting guide rods 1 and parallel therewith a sleeve 2 within which is mounted to rotate a worm 3. Mounted in bearings in the plates of the frame is a shaft 4 on which turns loosely a power driven pulley 5 carrying one member of a clutch 6 the opposite member 7 of which is splined to the shaft and provided with an ordinary shifting fork 8. The end of the shaft 4 projecting beyond the frame plate 9 carries a cylindrical holder 10 adapted to receive in the usual way the record cylinder 11. On the other end of the shaft there is a pinion 12 which, through gears 13, 14, transmits motion to a pinion 15 on

the worm shaft. When the clutch is engaged the worm and record holder 10 are simultaneously rotated.

The record making part of the apparatus comprises a frame having a dependent portion 16 provided with a bracket 17 embracing and running upon the supporting and guiding rod 1. The upper portion of the frame is horizontally disposed and comprises an iron plate 18 of adequate mass at the side of which is a sleeve 20 that embraces and travels upon the sleeve 2 within which the worm 3 is disposed. On the under face of the plate 18 are carried downwardly projecting cores of an electromagnet 19, 19, partially surrounded by a permanent magnet 20<sup>a</sup> also secured to the under face of plate 18. The function of the permanent magnet is to saturate the electromagnet which vibrates the stretched metal band. If this permanent magnet were not employed, the weak pulsating current, which is created in the winding of the electromagnet when the circuit is closed by the operation of the transmitter, would not set up a magnetic fluctuation, but would be diffused in the electromagnet. In appropriate proximity to the poles of the magnet is a soft iron armature 21 carried by a stretched metal band 22 of appropriate material, preferably iron. This band is mounted at one end in a block 23 having a tapped aperture engaged by an adjusting or straining screw. At the other end of the band is attached a block 24 engaging downwardly projecting portions 25 of the frame and having on each side of the band 22 knife edges 26 that seat in notches 26<sup>a</sup> in the outer face of such portions 25. This affords a convenient construction capable of ready control in the way of adjustment and manipulation. Beneath the band 22 is a floating lever 27 rocking at one end on trunnions 46 and free at the other. In a slot 28 in this lever is pivoted intermediate its ends at 29 the recording stylus lever. One end of this lever is connected by a link 31 to a centrally disposed eye 32 on the band 22, and in the other end is fixed the recording stylus 30. The free end of the floating lever 27 preferably has applied to it a weight 33 that may be removable, if desired, so that the gravity stress imposed upon the stylus lever through its pivot may be varied. This weight is shown



as a small disk or plate having a stud seating in an aperture in the lever near to its free end. The fixed sleeve 2, within which the worm rotates has in its under face a longitudinal slot 34. The sleeve 20 has a diametric slot to receive a lever 40 that turns on sleeve 2 and rigidly attached to sleeve 20 is a pendant hanger having side arms 36 whose ends are connected by a cross bar 37. This bar is apertured to receive a vertically movable post 38 whose upper end is adapted to engage and cooperate with the worm into engagement with which a spiral spring surrounding the post normally tends to urge it. The upper end of the post is bifurcated so that it may have two teeth or ends to engage the worm. At the base of the bifurcation there is an inclined cam face 39 with which cooperates a cam face 40' formed upon lever 40 that works between the bifurcations of the post.

When the lever arm 40 is moved to the position shown in Fig. 3, post 38 is allowed to rise to bring its ends or teeth into engagement with the worm to cause travel of the frame, that carries the recording mechanism, longitudinally of the axis of the record holder 10. When the lever is thrown to the position indicated in Fig. 1, the cam upon its lower end forces downwardly the post 38 thereby arresting movement of the carriage; and, at the same time, the cam face of the lever operates upon a plate 41 pivoted on the inner side of the cross piece 37 moving it inwardly to the position shown in Fig. 1. Near one end of this plate is pivotally connected a rod 42 surrounded by a coil compression spring 43. This rod passes through an apertured block 44 fixed on the frame and engages an arm 45 extending upwardly from the trunnion shaft 46 to which lever 27 is secured. In this way, the lever 27, and with it the recording stylus lever, is elevated to inoperative position. It may be returned to operative position by reaction of the spring 43 when lever arm 40 is moved to the position indicated in Fig. 3. Preferably, a stop 47 on the side of the rocking plate 41 is provided to limit descent of the floating lever 27 should the apparatus be started without a record cylinder in position. A flange 48 on the sleeve 20 is formed with depressions 49, 49, adapted to be engaged by the rounded end of a spring pressed pin 50 projecting laterally from lever arm 40 and acting to hold that arm in either of its two positions.

With the apparatus in the position indicated in Fig. 3, the weight of the floating lever acting through the stylus carrying lever causes desired pressure of the stylus upon the surface of the record cylinder. The vibrations of the band 22 produce oscillations of the stylus lever about its axis to produce a record upon the cylinder. Con-

tact of the point of the stylus with the surface of the cylinder is re-inforced by the gravity stress of the floating lever, the action being such as to produce substantially uniform pressure or contact even though the surface of the record cylinder may not be exactly cylindrical, or the record cylinder is not exactly concentric to the axis about which it rotates. Furthermore, the stylus lever in its oscillations is influenced by the inertia of the floating lever and this I have found also to be a factor aiding in the production of perfect results.

Having thus described my invention, I claim:—

1. An electrically operated sound recording apparatus, comprising a support, an electromagnet carried thereby, a stretched vibratory metal band adapted to be vibrated by said electromagnet, a permanent magnet disposed in proximity to said electromagnet, and a stylus adapted to be vibrated by said vibratory metal band.

2. An electrically operated sound recording apparatus, comprising a support, an electromagnet carried thereby, a permanent magnet partially surrounding said electromagnet, a stretched vibratory metal band adapted to be vibrated by the electromagnet, and a stylus adapted to be actuated by the vibration of the vibratory metal band.

3. An electrically operated sound recording apparatus, comprising a support, an electromagnet carried thereby, an approximately horse-shoe shaped magnet bar partially surrounding said electromagnet, a stretched metal vibratory band adapted to be vibrated by said electromagnet, and a stylus adapted to be actuated by the vibration of said vibratory band.

4. An electrically operated sound recording apparatus, comprising a frame, an electromagnet carried thereby, a permanent magnet partially surrounding said electromagnet, a stretched metal band mounted in said frame in proximity to said electromagnet, means to regulate the tension of said band, a floating lever having one end pivoted to said frame, a stylus lever pivotally mounted upon said floating lever, a stylus at one end of said lever, and means connecting the other end of said stylus lever with the metal band.

5. In a sound recording apparatus, the combination with a supporting structure, of a carriage to move longitudinally of the same, a vibratory stretched metal band supported by the carriage, a lever pivotally connected with said carriage and provided near its pivot point with an upstanding flange, a recording stylus-lever pivotally connected with the first named lever, a worm-shaft to effect the longitudinal movement of the carriage, a reciprocatory shaft provided with means to engage the worm-shaft, a recipro-

catory rod to engage the upstanding flange of the first named lever, a swinging link pivotally connected with one end of the reciprocatory rod to support the same, a compressible coil spring surrounding the reciprocatory rod to move the same in one direction, and a common lever to move the reciprocatory shaft and the swinging link.

6. In combination, means for supporting and rotating a record cylinder, a carriage traveling in proximity thereto, a permanent magnet supported by the carriage, an electromagnet disposed within the permanent magnet, a stretched vibratory metal band disposed near the electromagnet to be vibrated thereby, means pivotally connecting one end of said metal band with said

carriage, and means including a stylus to be operated by said metal band.

7. In combination, means for supporting and rotating a graphophone record, a carriage traveling in proximity thereto, a permanent magnet supported by the carriage, an electromagnet disposed in coöperative relation to the permanent magnet, a stretched metal band disposed near the electromagnet to be vibrated thereby, and means including a stylus to be operated by said metal band.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN NOLL.

Witnesses:

EUGENE DEL MAR,  
EDW. L. LANGLEY.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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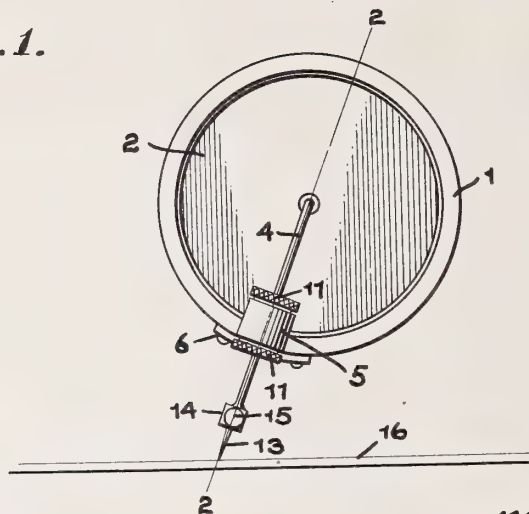


J. P. SHINN.  
 NEEDLE CONTROLLING MEANS FOR SOUND BOXES.  
 APPLICATION FILED JUNE 28, 1912.

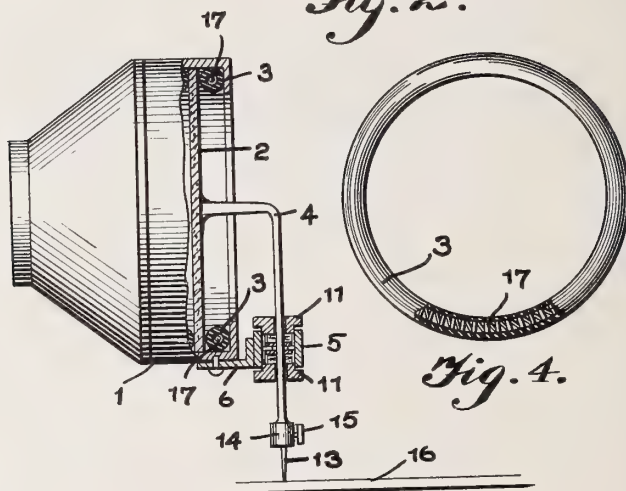
1,048,219.

Patented Dec. 24, 1912.

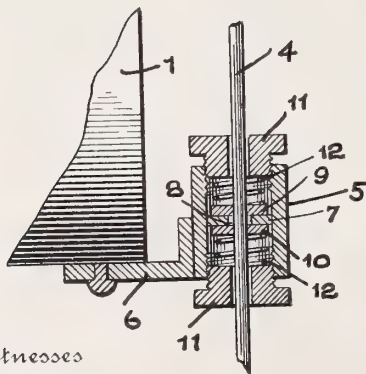
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



*Fig. 4.*

Inventor,

*James P. Shinn.*

Witnesses

*L. P. Meyer*  
*R. A. Kunkel*

By *Joshua R. W. Potts*  
 Attorney

# UNITED STATES PATENT OFFICE.

JAMES P. SHINN, OF CAMDEN, NEW JERSEY.

NEEDLE-CONTROLLING MEANS FOR SOUND-BOXES.

1,048,219.

Specification of Letters Patent.

Patented Dec. 24, 1912.

Application filed June 28, 1912. Serial No. 706,503.

*To all whom it may concern:*

Be it known that I, JAMES P. SHINN, a citizen of the United States, residing at Camden, in the county of Camden and State of New Jersey, have invented certain new and useful Improvements in Needle-Controlling Means for Sound-Boxes, of which the following is a specification.

My invention relates to improvements in needle controlling means for sound boxes, the object of the invention being to provide a phonographic sound box with improved means for controlling the vibration of the needle, which means is always under the control of the operator, so that the needle may be allowed just the proper amount of vibration to insure the best possible results.

A further object is to provide an improved diaphragm having a needle arm fixed thereto and projected through a cylinder in which mechanism is provided for elastically controlling the vibration of the needle arm.

With these and other objects in view, the invention consists in certain novel features of construction, and combinations and arrangements of parts, as will be more fully hereinafter described and pointed out in the claims.

In the accompanying drawings: Figure 1 is an end view of the sound box illustrating my improvements. Fig. 2 is a view partly in section on the line 2—2 of Fig. 1. Fig. 3 is a fragmentary view in section on an enlarged scale illustrating the needle arm controlling mechanism, and Fig. 4 is a view in elevation partly in section showing an improved form of diaphragm holding gasket.

1 represents a sound box in one end of which a diaphragm 2 is located and secured against a gasket 3 preferably having a coiled wire core 17, and a needle arm 4 is fixed to the center of the diaphragm. This needle arm is bent at right angles as shown and projects through a cylinder 5 fixed to the sound box by means of a bracket 6. In the center of the cylinder 5, a disk 7 is located, and this disk fits snugly in the cylinder and has a central opening 8 appreciably larger than the diameter of the needle arm which projects therethrough. On opposite sides of the disk 7, disks 9 and 10 respectively are located. These disks 9 and 10 have central openings of approximately the same diameter as the needle bar through which the latter projects, and they are of a diameter appreciably less than the internal diameter of

the cylinder, so that they have a certain amount of lateral movement in the cylinder.

The opposite ends of the cylinder 5 are internally screw-threaded to receive plugs 11, and between the plugs 11 and the disks 9 and 10, coiled springs 12 are located which exert pressure on the disks 9 and 10. A needle 13 is secured in a sleeve 14 on the end of the needle arm by means of a thumb screw 15, and when this needle passes over the record illustrated at 16, it will vibrate and cause the diaphragm to vibrate as is customary. To control this vibrating movement of the needle, my improved arrangement of disks, springs, and plugs are provided in the cylinder 5, and it will be seen by adjusting these plugs the movement of the disks 9 and 10 on the faces of disk 7 will be regulated. In other words, the friction of these disks one upon the other will be controlled by the position of the plugs 11, and this vibration permitted the needle may be varied in accordance with the record.

Various slight changes might be made in the general form and arrangement of parts described without departing from my invention, and hence I do not limit myself to the precise details set forth, but consider myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination with a sound box, a diaphragm therein, and a needle arm connected to the diaphragm, of a cylinder secured to the sound box and through which said needle arm projects, a disk fitting the cylinder and having an opening therein larger than the needle arm through which the latter projects, disks on opposite sides of the first-mentioned disk having openings therein fitting the arm, said last-mentioned disks being smaller than the internal diameter of the cylinder, and means exerting pressure on said disks, substantially as described.

2. The combination with a sound box, a diaphragm therein, and a needle arm connected to the diaphragm, of a cylinder secured to the sound box and through which said needle arm projects, a disk fitting the cylinder and having an opening therein larger than the needle arm through which the latter projects, disks on opposite sides of



the first-mentioned disk having openings therein fitting the arm, said last-mentioned disks being smaller than the internal diameter of the cylinder, said cylinder being internally screw-threaded in its ends, plugs in said ends, and coiled springs between the plugs and the disks, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of 10 two subscribing witnesses.

JAMES P. SHINN.

Witnesses:

GEO. M. SMITH,  
E. S. WENTZ.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

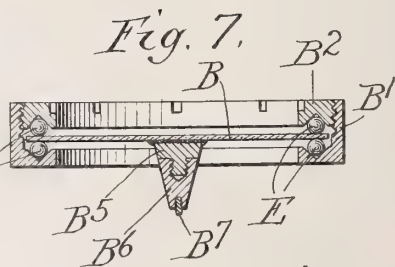
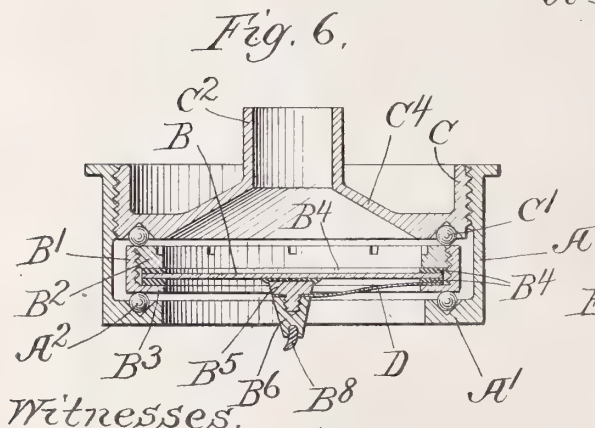
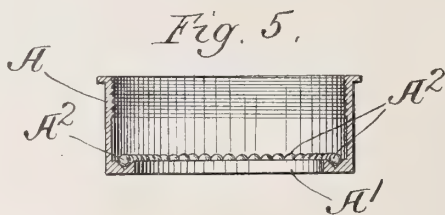
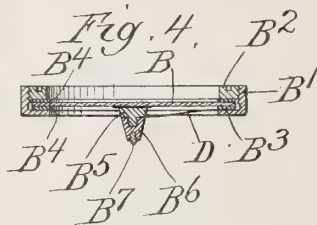
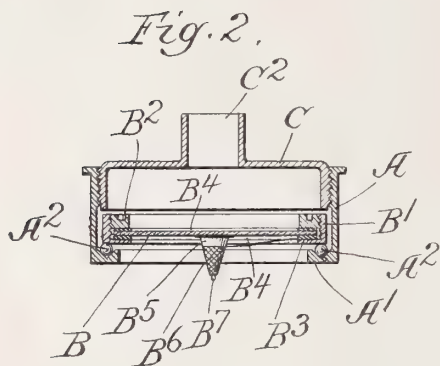
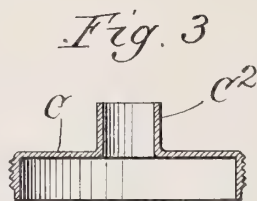
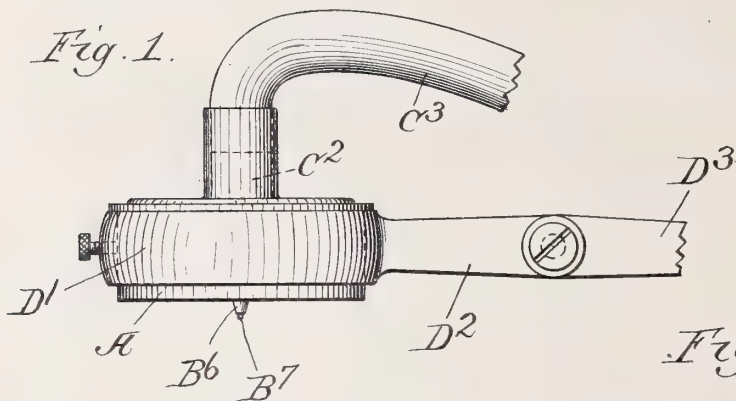
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D. H. WILSON.  
 RECORDING AND REPRODUCING DEVICE FOR PHONOGRAPHS.  
 APPLICATION FILED DEC. 29, 1904.

1,048,924.

Patented Dec. 31, 1912.



Witnesses:  
 Edward T. Wray.  
 Homer K. Kraft.

Inventor.  
 David B. Wilson  
 by Parker & Carter  
 Attorneys.

# UNITED STATES PATENT OFFICE.

DAVID H. WILSON, OF CHICAGO, ILLINOIS.

RECORDING AND REPRODUCING DEVICE FOR PHONOGRAPHS.

1,048,924.

Specification of Letters Patent.

Patented Dec. 31, 1912.

Application filed December 29, 1904. Serial No. 238,740.

*To all whom it may concern:*

Be it known that I, DAVID H. WILSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Recording and Reproducing Devices for Phonographs, of which the following is a specification.

My invention relates to recording and reproducing devices for phonographs, and the like, and has for its object to produce a new and improved device of this description which may be used either as a recorder or a reproducer.

My invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a side view of a device embodying my invention; Fig. 2 is a sectional view of the device shown in Fig. 1; Figs. 3, 4 and 5 show the parts of the device of Fig. 2 separated; Fig. 6 is a sectional view showing a modified construction; Fig. 7 is a view showing a further modification.

Like letters refer to like parts throughout the several figures.

In carrying out my invention I provide an outer shell or cylinder A, having an inwardly projecting part or flange A<sup>1</sup>. The diaphragm B of any suitable material is mounted in a diaphragm support B<sup>1</sup>, and is held in place by an adjustable holding piece B<sup>2</sup> adjustably attached to the support B<sup>1</sup>, as, for example, by being screw threaded therein, said support having a flange B<sup>3</sup> toward which the diaphragm is pressed. I prefer to provide washers B<sup>4</sup> on each side of the diaphragm, as shown in Fig. 2, such washers to be of more or less elastic material. The reproducing or recording point is attached to the diaphragm in any desired manner. When the device is to be used either as a reproducer or recorder these points must be removably attached to the diaphragm so that one may be removed and the other attached as desired. This may be accomplished, for example, by fastening to the diaphragm a holding piece B<sup>5</sup> adapted to receive a removable piece B<sup>6</sup> carrying the reproducing or recording point. In Fig. 2 I have shown a reproducing point B<sup>7</sup> and

in Fig. 6 a recording point B<sup>8</sup>. The diaphragm support B<sup>1</sup> is connected with the cylinder A in any desired manner, and is preferably supported upon the flange A<sup>1</sup> by means of balls A<sup>2</sup>. The diaphragm support is made smaller than the inside dimensions of the cylinder so that it may be free to move in such cylinder, such support moving freely on the ball bearings. A holding piece C is adjustably connected with the cylinder or shell A in any desired manner, as by being screw threaded therein. When the device is to be used as a reproducer the holding piece is adjusted so as to leave the diaphragm and its support free so that the diaphragm is free to move in any direction to permit the reproducing point to follow the devious path required. It will be seen that by this means the point can move freely in any direction, and that this movement occurs within the cylinder or casing A. If now it is desired to use the device as a recorder, the point must be stationary, and this result can be secured by screwing down the holding piece C so as to engage the diaphragm support and hold it against movement. The reproducing point can then be removed, and the recording point attached, although a single point might be used for both purposes by having it properly shaped. It will therefore be seen that the only thing necessary to change the device from a reproducer to a recorder, and vice versa, is the movement of the holding piece C to either engage the diaphragm support or release it. The holding piece C is provided with an opening and a sleeve-like part C<sup>2</sup> to which is connected the tube C<sup>3</sup> which leads to the ear or mouth of the person using the device.

In Fig. 6 I have shown a modified construction wherein balls C<sup>4</sup> are interposed between the holding piece C and the diaphragm support. This holding piece C is also arranged in a different manner. In Fig. 2 the part of the holding piece which engages the cylinder A projects in a direction opposite to that of the cylindrical part C<sup>2</sup>. In Fig. 6 both of these parts project in the same direction from the web C<sup>4</sup>, and this web is in



clined, as shown. In other words, the engaging part, which engages the cylinder A, and the cylindrical part, through which the sound is conveyed, are connected by an inclined web. By supporting the diaphragm upon balls only a small contact is secured, that is it is only supported at intervals, and consequently greater elasticity and responsiveness are secured. It will also be seen that it is impossible for the diaphragm to jump, as its movement is limited but is yet sufficient to produce the desired result of permitting the point to move as required.

In Fig. 7 I have shown the diaphragm supported directly upon balls E, such balls being contained within the diaphragm support B<sup>1</sup>. This increases the elasticity and vibratory characteristics of the diaphragm, and thus increases its efficiency and insures its satisfactory action.

I have described in detail a certain particular construction embodying my invention, but it is of course evident that the parts may be varied in many particulars and some of the parts omitted and others used with parts not herein shown without departing from the spirit of my invention. I, therefore, do not limit myself to the particular construction shown.

When the recording point is used it is often desirable to provide it with a stiffening device to prevent it from tipping. This stiffening device thus stiffens the diaphragm and relieves it of the tipping strain. I have shown one form of such device in Fig. 6, wherein D is a spring connected with the recording point at one end and attached at the other end to the diaphragm support, as by being inserted between one of the washers B<sup>4</sup> and the projecting part B<sup>3</sup>. It will be noted that this spring makes no contact whatever with the diaphragm. The shell A is held in position in any desired manner, as, for example, by a clamp D<sup>1</sup> provided with an arm D<sup>2</sup> hinged to the support D<sup>3</sup> by means of which the device is supported in proper position.

I claim:

1. A reproducing device for phonographs comprising an outer shell, a diaphragm associated therewith, a diaphragm support to which said diaphragm is connected, said diaphragm support movably mounted in said shell so as to be free to move laterally there being a free open space between the diaphragm support and the inner face of said shell.

2. A combined reproducer and recorder for phonographs comprising an outer shell, a diaphragm associated therewith, a diaphragm support to which said diaphragm is connected, said diaphragm support movably mounted in said shell, and an adjustable holding piece extending entirely around

the shell and adapted to be moved so as to clamp the diaphragm support to prevent its lateral movement with relation to the shell.

3. A reproducing device for phonographs comprising an outer shell, a diaphragm associated therewith, a diaphragm support to which said diaphragm is connected, said diaphragm support movably mounted in said shell so as to be free to move laterally, and a series of balls upon which said diaphragm support is carried.

4. A device for phonographs comprising a shell, a diaphragm having a point connected therewith, a support to which said diaphragm is connected, said diaphragm support smaller than the shell so as to be free to move therein, two series of balls, one on each side of said diaphragm support, and an adjustable holding piece associated with one series of balls.

5. A device for phonographs comprising a shell, a diaphragm having a point connected therewith, a diaphragm holder to which said diaphragm is connected and loosely mounted in said shell and disconnected from the shell so as to be free to move laterally, an adjustable holding piece for said diaphragm support for limiting its movement.

6. A device for phonographs comprising a shell, a diaphragm having a point connected therewith, a diaphragm holder to which said diaphragm is connected and loosely mounted in said shell, an adjustable holding piece for said diaphragm support for limiting its movement, said holding piece comprising an engaging part which engages the shell and a cylindrical part connected thereto by an inclined web and projecting in the same direction therefrom.

7. A device for phonographs comprising an outer shell, a diaphragm associated therewith, a diaphragm support to which said diaphragm is connected, said diaphragm support movably mounted in said shell, an adjustable holding piece associated with the shell, and a series of balls between said adjustable holding piece and the diaphragm support.

8. A device for phonographs comprising an outer shell, a diaphragm provided with a point mounted in said shell so as to be free to move laterally when the device is acting as a reproducer, and means for clamping the diaphragm to the shell when the device is acting as a recorder.

9. A reproducing device for phonographs comprising a diaphragm, an outer shell therefor, means for mounting the diaphragm in the shell so that it is free to move in the shell in a plane parallel to itself.

10. A reproducing device for phonographs comprising an outer shell, a diaphragm therein, balls above and below the

diaphragm and between which said diaphragm is mounted so as to be free to move laterally.

11. A reproducing device for phonographs, comprising a diaphragm, a holding part therefor, an outer shell containing the holding part, a free space between the holding part and the outer shell free from cen-

tering means, whereby the diaphragm and holding part are free to move in a plane 10 parallel to the diaphragm.

DAVID H. WILSON.

Witnesses:

HOMER L. KRAFT,  
LUCY A. FALKENBERG.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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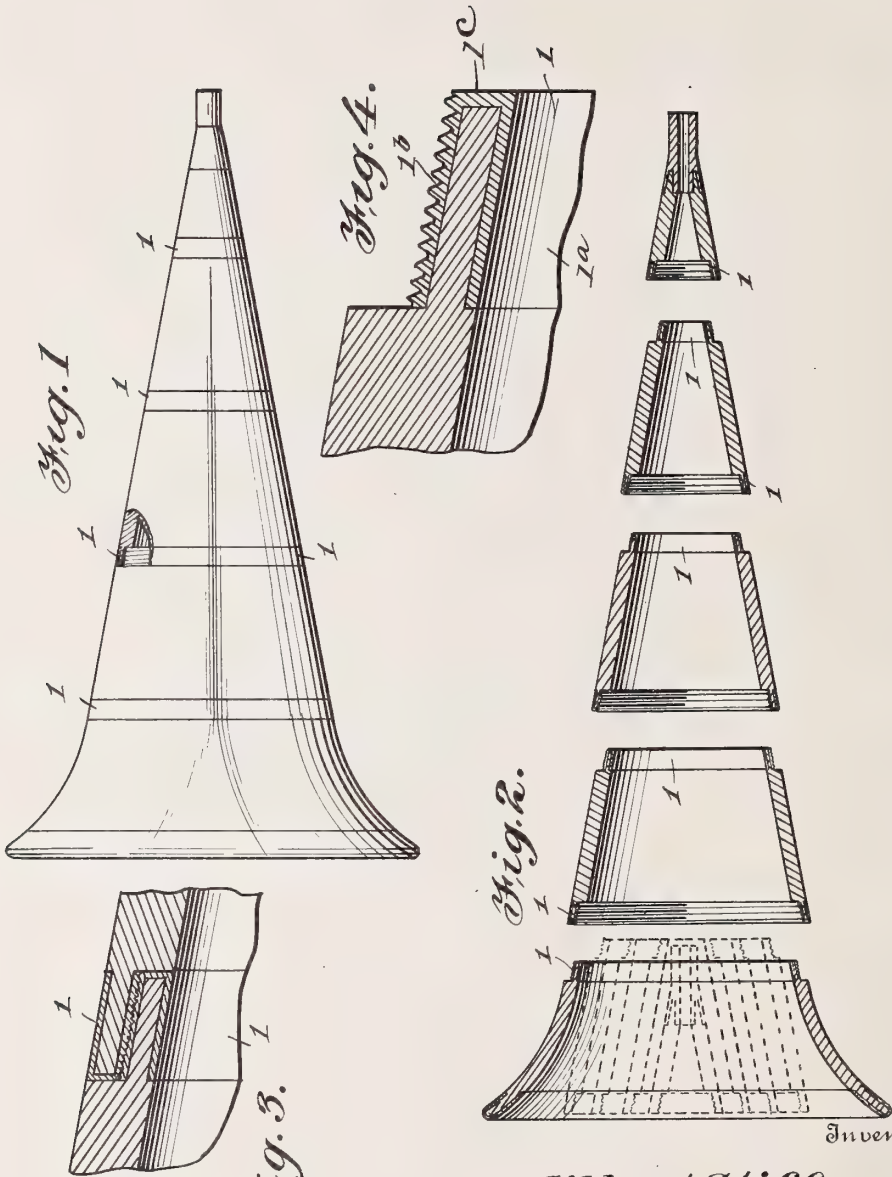




G. STIFF.  
 COLLAPSIBLE PHONOGRAPH HORN.  
 APPLICATION FILED OCT. 21, 1911.

1,049,166.

Patented Dec. 31, 1912.



Witnesses  
*J. H. Lybrand*  
*C. B. Willyard.*

*Albert Stiff*  
 By *Victor J. Evans*  
 Attorney

# UNITED STATES PATENT OFFICE.

GILBERT STIFF, OF OVID, MICHIGAN.

COLLAPSIBLE PHONOGRAPH-HORN.

1,049,166.

Specification of Letters Patent.

Patented Dec. 31, 1912.

Application filed October 21, 1911. Serial No. 655,965.

*To all whom it may concern:*

Be it known that I, GILBERT STIFF, a citizen of the United States, residing at Ovid, in the county of Clinton and State of Michigan, have invented new and useful Improvements in Collapsible Phonograph-Horns, of which the following is a specification.

The invention provides a horn designed more especially for sound reproducing machines of the phonograph type, the purpose being the provision of a horn which will admit of its length being readily reduced so that the horn may be stored in a comparatively small space either for convenience of carrying or to be laid aside when not required for immediate use so as not to be in the way, the invention relating most essentially to the joint formed between the horn sections whereby both the inner and the outer side of the horn are practically smooth and continuous.

The invention consists of the novel features, details of construction and combination of parts, which hereinafter will be more particularly set forth, illustrated in the accompanying drawing, and pointed out in the appended claim.

Referring to the drawing, forming a part of the specification, Figure 1 is a side view of a horn of the type described embodying the invention, a part being broken away. Fig. 2 is a sectional view, the parts or horn sections being separated and the dotted lines showing the position of the sections when nested. Fig. 3 is an enlarged section of the joint formed between adjacent sections. Fig. 4 is an enlarged view of a part of one of the horn sections.

Corresponding and like parts are referred to in the following description, and indicated in all the views of the drawing, by the same reference characters.

The horn in its general appearance may be of any design such as commonly provided for sound reproducing machines and may be constructed of any material.

In order to admit of the length of the horn being reduced it is proposed to form the horn of longitudinal sections which are separable, each of the sections being approximately of frusto-conical form. The number of the horn sections and the length thereof will depend upon the size of the horn and the space into which the same is to be packed when the horn is reduced in length.

In accordance with the invention it is preferred to construct the horn of wood or like fibrous material. The edges or ends of the sections bordering upon or forming the joint are rabbeted or halved so that when the sections are placed together both the inner and the outer walls are smooth and practically continuous, while at the same time the parts of the horn sections forming the joints overlap. The horn sections are positively connected by providing the halved ends upon their longitudinal walls or faces with fine screw-threads which match and interlock when the sections are assembled, as indicated most clearly in Figs. 1 and 3. The end or edge portions of the horn sections are susceptible to contraction or expansion or to injury, which ordinarily would prevent assembling the sections. This difficulty is overcome by reinforcing the ends or edge portions of the horn sections, the reinforcement being in the nature of a metal binding 1, which embraces opposite sides of the section and extends over the end thereof. The reinforcement 1 consists of inner and outer tapered elements 1<sup>a</sup> and 1<sup>b</sup> and a connecting part 1<sup>c</sup> joining the outer ends of the elements 1<sup>a</sup> and 1<sup>b</sup>. One of such elements is threaded to engage matching screwthreads on the mating element of the adjacent horn section. The smaller ends of the horn sections are rabbeted on the outer sides and the larger ends are rabbeted on the inner sides. The outer elements of the reinforcements fitted to the smaller ends of the horn sections are threaded, whereas the inner elements of the reinforcements at the larger ends of such horn sections are threaded. The reinforcement 1 besides protecting the end of the horn section also serves to give a finished appearance thereto and prevents injury to the end of the section.

When the sections comprising the horn are assembled, as indicated in Fig. 1, both the inner and the outer walls are practically smooth and continuous. When the sections are separated they may be nested, as indicated by the dotted lines in Fig. 2, to admit of their occupying a small space or being packed into a case for convenience of carrying.

From the foregoing description, taken in connection with the accompanying drawing, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which

the invention appertains, and while I have described the principle of operation of the invention, together with the device which I now consider to be the embodiment thereof.

5 I desire to have it understood that the device shown is merely illustrative, and that such changes may be made when desired as are within the scope of the claim appended hereto.

10 Having thus described the invention what is claimed as new, is:—

A collapsible horn for phonographs comprising a plurality of separable sections of similar formation, each of said sections being of tapering form and having its ends rabbeted, the smaller end having the rabbet

on the outside and the larger end having the rabbet on the inside, and a metal reinforcement fitted to each rabbeted end and consisting of inner and outer tapered elements, 20 and a connecting part joining the outer ends of said elements, the joints between the sections being threaded and of such form as to present smooth inner and outer surfaces when the sections are assembled.

25 In testimony whereof I affix my signature in presence of two witnesses.

GILBERT STIFF.

Witnesses:

MILDRED B. HOLLAND.

HATTIE L. HOLLAND.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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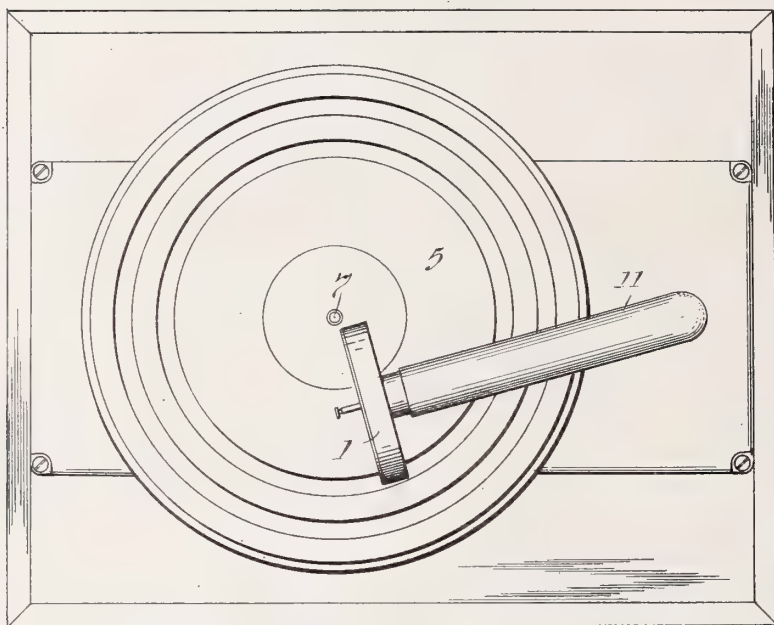


F. L. DYER.  
TALKING MACHINE.  
APPLICATION FILED AUG. 18, 1910.

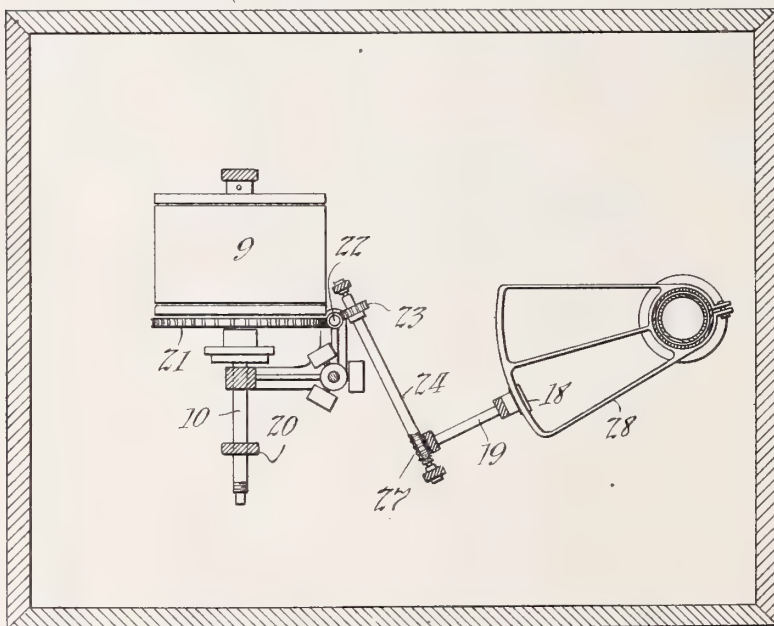
1,049,215.

Patented Dec. 31, 1912.

3 SHEETS—SHEET 1.



*Fig. 1*



*Fig. 2*

*Witnesses:*

Robert M. Duthent  
Dyer Smith

*Inventor:*

Frank L. Dyer

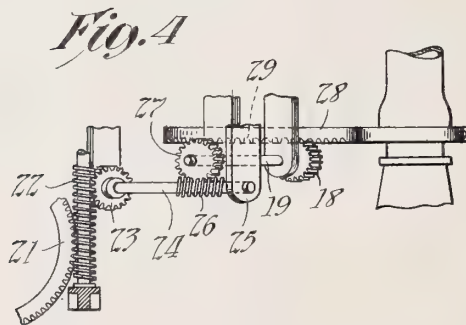
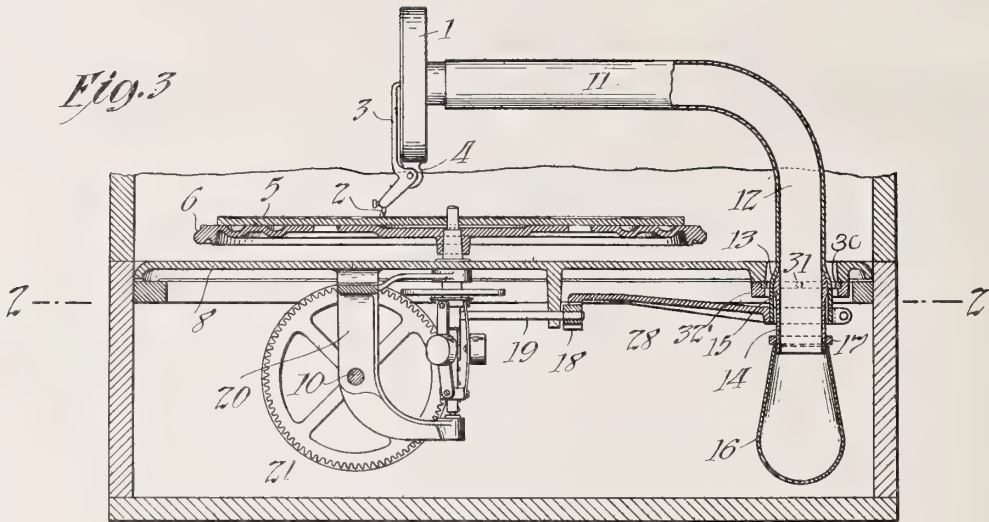


F. L. DYER.  
TALKING MACHINE.  
APPLICATION FILED AUG. 18, 1910.

1,049,215.

Patented Dec. 31, 1912.

3 SHEETS—SHEET 2.



*Witnesses:*  
Robert M. Sutphen.  
Dyer Smith

*Inventor:*  
Frank L. Dyer



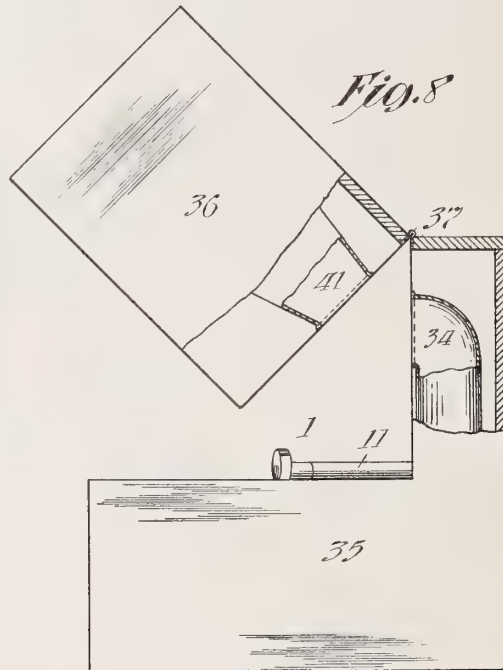
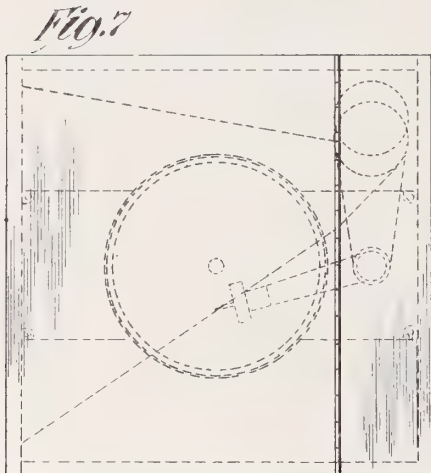
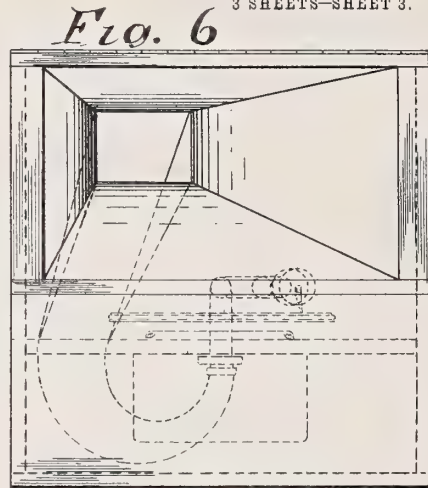
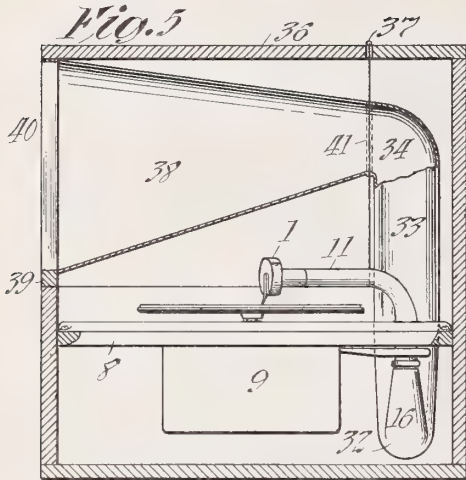


F. L. DYER.  
TALKING MACHINE.  
APPLICATION FILED AUG. 18, 1910.

1,049,215.

Patented Dec. 31, 1912.

3 SHEETS-SHEET 3.



*Witnesses:*  
Robert M. Sutphen  
Dyer Smith

*Inventor:*  
Frank L. Dyer

# UNITED STATES PATENT OFFICE.

FRANK L. DYER, OF MONTCLAIR, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS,  
TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A COR-  
PORATION OF NEW JERSEY.

TALKING-MACHINE.

1,049,215.

Specification of Letters Patent.

Patented Dec. 31, 1912.

Application filed August 18, 1910. Serial No. 577,774.

*To all whom it may concern:*

Be it known that I, FRANK L. DYER, a citizen of the United States, and a resident of Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Talking-Machines, of which the following is a description.

My invention relates to talking machines, and my object is to produce an improved device for feeding the reproducer and stylus carried thereby across a rotatable sound record of the disk type. I mount the sound conveying tube upon which the reproducer is carried by means of a ball and socket joint upon a fixed tube forming part of or connecting with the amplifying horn. By this ball and socket joint construction, the reproducer is free to be moved across the face of the record to give the feed, and also is free to be moved toward and away from the record surface. The movable hollow arm or tube carries a geared sector or other desired engaging means, which, upon the lowering of the reproducer to cause the stylus to engage a record, moves into mesh with a gear or other driving device connected with the motor. Thus, the feed may be engaged or disengaged at any point in the reproduction of a record by merely lowering the reproducing stylus into tracking position upon a record or raising it therefrom.

My invention also comprises an improved construction of a talking machine inclosed within a cabinet in which the sound amplifying horn is carried by the hinged cover of the cabinet.

Other objects of my invention comprise the construction of parts and combinations of elements hereinafter more fully described and set forth in the appended claims.

In order that a clearer understanding of my invention may be had, attention is hereby directed to the accompanying drawings forming part of this specification, in which—

Figure 1 represents a plan view of a reproducing talking machine embodying my invention. Fig. 2 represents a horizontal cross section taken on line 2—2 of Fig. 3. Fig. 3 represents a central vertical cross section through the talking machine shown in Fig. 1, certain parts being shown in side elevation. Fig. 4 is an enlarged detail per-

spective view of certain parts shown in Figs. 2 and 3. Fig. 5 is a vertical cross section of a talking machine similar to that shown in Fig. 3, provided with a hinged cover carrying the amplifying horn, certain parts being shown in side elevation. Fig. 6 is a front view of the machine and cabinet shown in Fig. 5. Fig. 7 is a plan view of the same, and Fig. 8 is a side elevation, the cover being shown in raised position.

Referring to the drawings, the reproducer 1 is provided with stylus 2 mounted in any suitable way, and connected with the diaphragm of the reproducer as by lever 3 pivoted at 4 to reproducer 1, stylus 2 being adapted to track a sound record 5 of the disk type mounted upon turn-table 6 supported by vertical spindle 7 which is rotatably mounted in horizontal member 8 and is adapted to be rotated by motor 9 mounted upon shaft 10, as is common. Reproducer 1 is mounted upon the end of sound conveying tube 11 which extends horizontally across record 5 rearwardly from reproducer 1 and thence bends downwardly, as shown at 12, extending through an opening in horizontal member 8. The downwardly directed portion 12 of tube 11 is provided toward its lower end with a swelling 13 approximately spherical in shape. The tube 14 extends upwardly within the lower end of downwardly directed portion 12 of tube 11 and is formed at its upper end with an approximately spherical swelling 15 upon its exterior, which is adapted to fit within the interior surface of spherical portion 13 of tube 12 to form a ball and socket joint. The lower end of tube 14 extends into the upper end of stationary tube 16, which is integral with or connected to the sound amplifying horn of the talking machine. Tube 14 may be secured to horn 16, or it may simply engage within the upper end of the same as shown, a collar or shoulder 17 upon the lower end of tube 14 resting upon the upper end of tube 16, as shown, to support tube 14.

Motor 9 is provided with a chain of gears connecting the shaft 10 thereof with a gear 18 which is shown as a spur pinion mounted upon horizontal shaft 19. Motor shaft 10, which is supported by bracket 20 from horizontal member 8, has a large worm wheel 21. This meshes with a worm 22 mounted vertically which in turn meshes with a worm wheel 23 mounted upon shaft 24 supported



by bracket 25. Shaft 24 has a worm 26 formed thereupon which meshes with a worm wheel 27 secured to shaft 19 upon the opposite end thereof from gear 18.

5 The lower end of rotatable tube 12 has a sector 28 secured thereto below the swelling 13. This sector is provided upon its lower face with gear teeth 29 adapted to mesh with gear 18 when stylus 2 is in operative  
10 position to track the record 5 upon turntable 6. When it is desired to stop the feed or to move the stylus to track a different part of the record, reproducer 1 is simply raised, the tube 11 swinging backwardly as  
15 surface 13 thereof slides over swelling 15 of tube 14, causing sector 28 to move out of engagement with gear 18. When the stylus is moved back into operative position, the sector engages gear 18, whereupon, if the  
20 motor 9 is running, the stylus will be fed positively across the record. If desired, means may be employed to prevent lateral oscillation of hollow arm 11 about its ball and socket joint in a direction at right  
25 angles to the plane of Fig. 3 of the drawings. I have shown one such means in the drawings, in which a ring 30 is mounted within the opening in member 8 through which tube 12 descends, surrounding spherical portion  
30 13 of tube 12 but out of contact with the same, sufficient space being left between swelling 13 and ring 30 to permit the necessary movement of stylus 2 toward and away from record 5. A pair of pins axially in  
35 line with each other, of which one is shown in Fig. 3 at 31, are secured in ring 30 and extend through swelling 13 of tube 12 to the inner surface thereof, tube 12 being rotatably mounted upon the inner ends of pins  
40 31. Ring 30 is slidable within a recess provided therefor in its seat in the lug 32 depending from member 8, so that when stylus 2 is fed across the record, ring 30 turns in its seat and when the stylus is raised out of  
45 contact with the record, tube 12 pivots about pins 31, surface 13 sliding over surface 15.

Tube 16 may be integral with or connected to the horn or sound amplifier in any desired manner. As shown in the drawings,  
50 tube 16 bends upwardly as shown at 32 and joins the vertically rising portion 33 of the horn, which has a forwardly extending elbow 34. The machine is preferably mounted in a cabinet 35, to which cover 36 is  
55 hinged on the top thereof, as shown at 37. Sound amplifying horn 38 is secured within cover 36, having its exit end situated in the front side 39 of the cover, which is provided with an opening 40 within which the exit  
60 end of horn 38 fits. Elbow 34 of sound conveying tube 33 abuts against the end 41 of horn 38 when the cover is closed, as shown in Fig. 5, to form one continuous horn.

It is obvious that my invention is not  
65 limited to the particular details of construc-

tion described, but is as broad as the appended claims.

Having now described my invention, what I claim and desire to protect by Letters Patent is as follows:—

1. In a device of the class described, the combination of a supporting member, a record support above said supporting member, a sound conveying tube, a sound box carried thereby and having its interior connected therewith, said tube extending rearwardly across said support from said sound box and thence downwardly through said supporting member, said downwardly extending portion having a pivotal connection with the supporting member, whereby the tube may be pivotally moved about a pair of axes at right angles to each other, and the end of said portion being below such pivotal connection, driving means supported below said supporting member, and engaging means carried by the end of said tube below the pivotal connection of the same with the supporting member, positioned to move into engagement with said driving means when said tube is swung to operatively position said sound box, substantially as described.

2. In a device of the class described, the combination of a supporting member, a record support above said supporting member, a sound conveying tube, a sound box carried thereby and having its interior connected therewith, said tube extending rearwardly across said support from said sound box and thence downwardly through said supporting member, said supporting member having a bearing for said tube providing for movement of the rearwardly extending portion of the same toward and away from the record support, driving means below said supporting member, and engaging means carried by the downwardly extending portion of said tube below said bearing positioned to move into engagement with said driving means when said tube is swung to operatively position said sound box, substantially as described.

3. In a device of the class described, the combination with a horizontal supporting member, a record support above said member, a sound conveying tube carrying a sound box, said tube extending rearwardly from said sound box and thence through said supporting member, said supporting member having a connection with the tube providing for movement of the rearwardly extending portion of the same toward and away from the record support and for movement substantially parallel to said support, rotating means below said supporting member, and means carried by the end portion of said tube below said connection positioned to move into engagement with said rotating means when said tube is swung to operatively position said sound box to

thereby move the sound box across said record support, substantially as described.

4. In a device of the class described, the combination of a sound conveying tube, a  
 5 sound box carried thereby and having its interior connected therewith, said tube extending rearwardly from said sound box and thence downwardly, a horizontal supporting member having an aperture through  
 10 which the downwardly extending portion of said tube extends, a ring horizontally and rotatably mounted in the walls of said aperture, the tube being pivotally connected to said ring at diametrically opposite points,  
 15 driving means beneath said supporting member, and engaging means carried by the downwardly extending portion of said tube below said supporting member, positioned to move into engagement with said driving  
 20 means when said tube is swung to operative position said sound box, substantially as described.

5. In a device of the class described, the combination of a sound conveying tube, a  
 25 sound box carried thereby and having its interior connected therewith, said tube ex-

tending rearwardly from said sound box and thence downwardly, a horizontal supporting member having an aperture through which the downwardly extending portion of  
 30 said tube extends, a ring horizontally and rotatably mounted in the walls of said aperture, the tube being pivotally connected to said ring at diametrically opposite points, a  
 35 fixed tube extending upwardly within the lower end of said downwardly extending portion and having a ball and socket joint connection therewith, driving means be-  
 40 neath said supporting member, and engaging means carried by the downwardly extending portion of said tube below said supporting member, positioned to move into engagement with said driving means when  
 45 said tube is swung to operative position said sound box, substantially as described.

This specification signed and witnessed this 16th day of August 1910.

FRANK L. DYER.

Witnesses:

DYER SMITH,  
 FRANK D. LEWIS.

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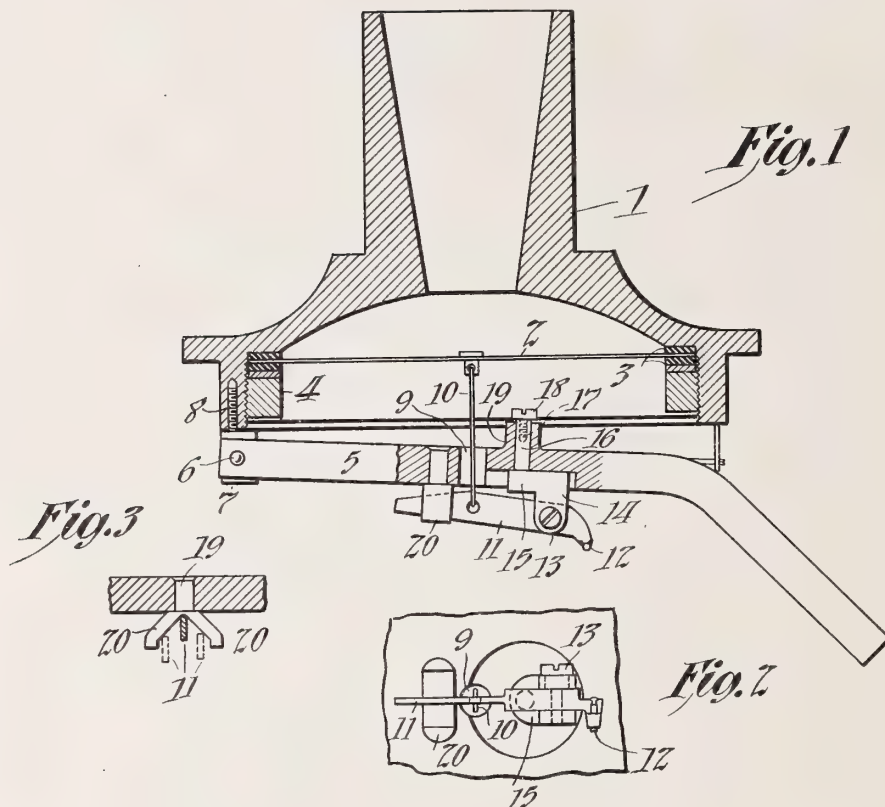




F. L. DYER & P. WEBER.  
 PHONOGRAPH REPRODUCER.  
 APPLICATION FILED MAR. 20, 1909.

1,049,216.

Patented Dec. 31, 1912.



*Witnesses:*  
 Frank D. Lewis  
 Dyer Smith

*Inventor*  
 Frank L. Dyer and  
 Peter Weber  
 by Frank L. Dyer,  
 Attorney.

# UNITED STATES PATENT OFFICE.

FRANK L. DYER, OF MONTCLAIR, AND PETER WEBER, OF ORANGE, NEW JERSEY,  
ASSIGNORS, BY MESNE ASSIGNMENTS, TO THOMAS A. EDISON, INCORPORATED, OF  
WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH-REPRODUCER.

1,049,216.

Specification of Letters Patent.

Patented Dec. 31, 1912.

Application filed March 20, 1909. Serial No. 484,811.

*To all whom it may concern:*

Be it known that we, FRANK L. DYER, a citizen of the United States, and residing at Montclair, county of Essex, and State of New Jersey, and PETER WEBER, a citizen of the United States, and residing at Orange, county of Essex, and State of New Jersey, have invented a certain new and useful Improvement in Phonograph-Reproducers, of which the following is a description.

Our invention relates to phonograph reproducers, our object being more particularly to provide for the greater freedom of movement of the stylus lever, in order that a more faithful reproduction of the vibrations of the sound record may be made, and that undue wear upon the stylus and record may be avoided.

Our invention relates more particularly to a novel means of mounting the stylus lever whereby greater freedom of movement of the same transverse to the record groove may be allowed.

Another object of our invention is the provision of means for alining the stylus lever in a central position whenever the stylus is lifted from the record surface.

Other objects of our invention will appear in the description following and in the appended claims.

Attention is hereby called to the accompanying drawings, embodying a preferred form of our invention, and in which—

Figure 1 is a side elevation, partly in section, of a reproducer embodying our invention. Fig. 2 is a bottom view of the same showing the stylus lever and connections and the adjacent portion of the floating weight, and Fig. 3 is a detail view of the means for alining the stylus lever centrally.

The same reference numerals are used throughout the various views to denote corresponding parts.

Referring to the drawings, 1 represents a sound box body of the usual form. A diaphragm 2 is secured between gaskets 3 by a clamping ring 4 threaded in a depending flange of the body 1. The floating weight 5 is pivoted at 6 to the pivot block 7, which is pivotally secured to the body 1 by the usual screw 8. The floating weight 5 is provided with a vertical passageway 9 through which passes the link 10 which connects the center of the diaphragm 2 with

the stylus lever 11. The stylus lever 11 carries the stylus 12, and said lever 11 is pivoted on the horizontal screw or stud 13, which is mounted in depending lugs 14. These lugs 14 have formed therewith the arm 15, which extends back from the pivot 13 parallel or substantially so to the body of the floating weight 5 in the direction of the link 10. The stud 16 is rotatably mounted in the floating weight and is integral with or secured to the arm 15 at the end of the said arm nearest to the link 10. The stud 16 is mounted in a position approximately at right angles to the diaphragm 2, and is mounted to be easily rotatable in the weight 5 by any convenient means, as by the short screw 17 shown in the drawings, the head 18 of which screw rests upon the upper surface of the boss 19 of the floating weight.

It will thus be seen that the stylus lever 11 is so mounted as to have pivotal movement in a plane substantially at right angles to the diaphragm 2 about its pivot 13, and in a plane substantially parallel to the diaphragm 2 about its stud 16 as an axis. Furthermore, it will be seen that the axes 16 and 13 do not intersect. The arm 15 on the stud 16 constitutes, in effect, a crank arm, whereby the stylus 12 is allowed movement lateral to the record groove in an arc described about the stud 16 as a center. Of course, the greater the distance from the stud 16 to the stylus 12, the flatter will be the arc described by the stylus in movements transverse to the record groove, whereby a more truly universal movement of the stylus is attained. It will be observed that this desirable length of radius of the stylus in its transverse movements might be attained by eliminating crank arm 15 and placing pivot 13 directly below stud 16, so that the axes 16 and 13 would be intersecting, as has been proposed, but in this case the desirable relation between the lengths of the lever arms from the pivot 13 to the stylus 12 and to the point of connection of the link 10 with the stylus, whereby the vertical movement of the stylus in tracking the record grooves is amplified, would be seriously interfered with.

In Fig. 3 we have shown a detail view of the means for alining the stylus lever. This consists of the vertical member 19 secured in the floating weight 5, which member is pro-



vided on the under side of the floating weight with depending branches 20 in the form of an inverted V. These branches 20, 20 embrace the tail of the stylus lever 11. 5 When the stylus 12 is in contact with the record surface, the tail of the lever 11 will be forced downwardly some distance from the under surface of the floating weight 5 so that the lever may move laterally through a 10 considerable arc before the tail of the lever encounters the side of one of the stops 20, as is shown in dotted lines in Fig. 3. When, however, the reproducer is lifted so that the stylus is removed from the record surface 15 for any purpose, the tail of the lever is raised, the inclined inner surface of the arm 20 with which the tail of the lever is in contact guiding the same to a central position so that when the reproducer is again lowered 20 to place the stylus in contact with the record groove, the lever will be in proper alinement parallel to said groove.

Having now described our invention, what we claim and desire to protect by Letters 25 Patent is as follows:

1. In a phonograph reproducer, the combination with a floating weight, of a stylus lever, a stud on which said lever is pivotally supported, a stud rotatably mounted in said 30 weight substantially at right angles to said first named stud, a crank member on the second stud supporting the first, a member connected to said weight and having an inverted V-shaped recess embracing the tail of said 35 lever for centering the same, substantially as described.

2. In a phonograph reproducer, the combination with a floating weight, of a stylus lever, a stud on which said lever is pivotally supported, a stud rotatably mounted in said 40 weight, substantially at right angles to said first named stud, said second stud having formed therewith a crank member extending at right angles to said stud and depending ears at the end of said crank member, said 45 ears supporting said first named stud, a member connected with said weight and having an inverted V-shaped recess embracing the tail of said lever for centering the same, 50 substantially as described.

3. In a phonograph reproducer, the combination with a floating weight of a stylus lever and a stylus carried thereby, a diaphragm, means supporting said lever from said weight about which said lever is free to 55 rock in directions substantially parallel to and at right angles to said diaphragm, a connection from said diaphragm to said lever, and a member connected with said weight and having an inverted V-shaped recess embracing the tail of said lever for centering the same, substantially as described. 60

FRANK L. DYER.  
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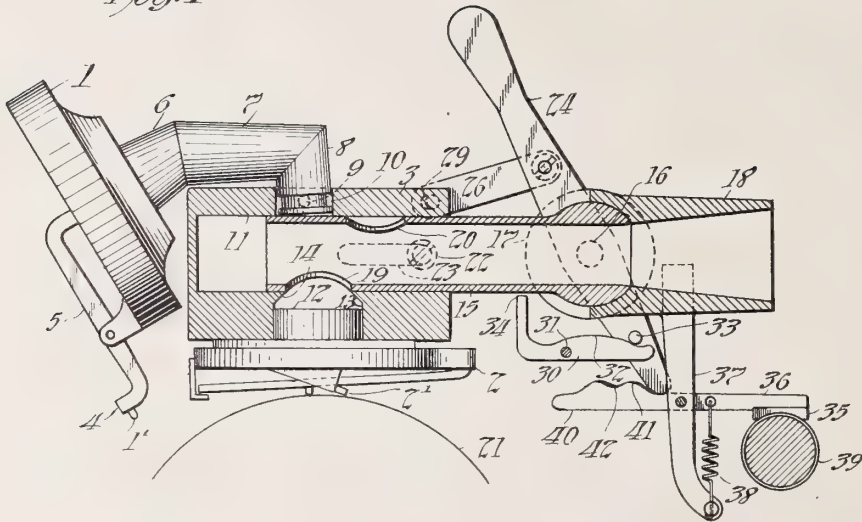


N. H. HOLLAND.  
 PHONOGRAPH.  
 APPLICATION FILED OCT. 6, 1911.

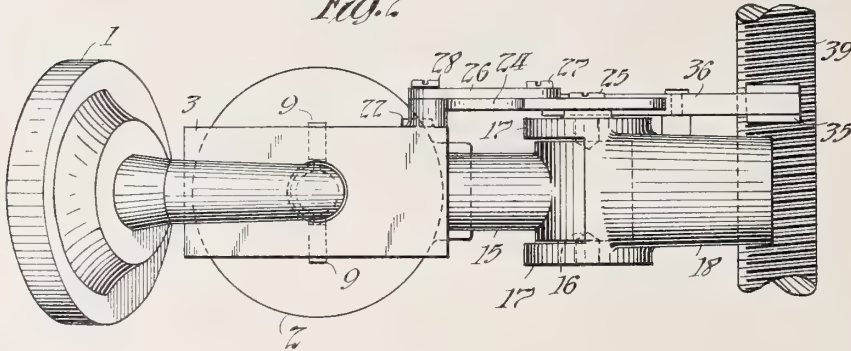
1,049,237.

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*Fig. 1*



*Fig. 2*



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 Newman H. Holland,  
 by Frank L. Brown  
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# UNITED STATES PATENT OFFICE.

NEWMAN H. HOLLAND, OF WEST ORANGE, NEW JERSEY, ASSIGNOR TO THOMAS A. EDISON, INCORPORATED, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## PHONOGRAPH.

1,049,237.

Specification of Letters Patent.

Patented Dec. 31, 1912.

Application filed October 6, 1911. Serial No 653,154.

*To all whom it may concern:*

Be it known that I, NEWMAN H. HOLLAND, a subject of the King of Great Britain, and a resident of West Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographs, of which the following is a description.

My invention relates to phonographs and more particularly to those adapted for use for commercial purposes, although obviously the invention may be used in connection with other types of phonographs.

The principal object of my invention is to provide an improved recorder and reproducer support, preferably carried by the traveling carriage or carrier arm, and provided with means for operating the same so as to bring either the recorder or reproducer into operative position with respect to the record surface, or for bringing the parts into such position that both the recording and reproducing styli are entirely clear of the record surface so that the record cylinder can be removed from or placed on its support without contacting with either of said styli, and the traveling carriage can be shifted without injury to either the record or the reproducer and recorder. A sound conveying tube to which an amplifying horn or other sound conveyer may be applied is provided, and the recorder and reproducer are connected with this tube in such a way that when the recorder is in operative position, the interior thereof is in communication with the said tube, while the interior of the reproducer is entirely out of communication therewith, and vice versa. Means are also provided for rendering inoperative the mechanism for feeding the reproducer and recorder across the record surface when the support is being adjusted to place one stylus in operative position and remove the other therefrom.

Other objects of my invention will appear more fully in the following specification and appended claims.

In order that my invention may be more fully understood, attention is hereby directed to the accompanying drawing forming a part of this specification and in which—

Figure 1 is a central vertical sectional

view of one embodiment of my invention, some of the parts being shown in elevation. Fig. 2 is a plan view thereof.

In all the views like parts are designated by the same reference numerals.

Referring to the drawings, reproducer 1 provided with stylus 1' and recorder 2 provided with stylus 2' are supported in a frame or slide 3. These instruments may be of any approved construction; but I prefer to arrange the reproducer at an angle to the recorder, as shown in the drawings, and to mount the reproducing stylus 1' in the lower surface of an offset 4 on the lever 5, which latter is pivoted to the reproducer casing and connected at its inner end to the diaphragm (not shown) of the reproducer. The neck 6 of the reproducer is formed with a substantially horizontal extension 7 from which depends a downwardly directed portion 8, the end of which is pivoted as shown at 9 within an opening 10 in the upper part of the frame or slide 3, this opening communicating with the substantially horizontal bore 11 of the slide 3. The pivotal mounting of the reproducer permits the same to adjust itself to the eccentricity or other irregularities in the record surface without the necessity of raising the slide and the parts supporting the same, and to permit the stylus to follow the record thread. The neck 12 of the recorder fits tightly in the opening 13 in the lower portion of the slide, this opening being formed at its upper end with a conical portion 14 by which it communicates with the bore 11.

A sound conveying tube 15 fits closely within the bore 11 of the slide or frame 3, the bore 11 being closed at the end remote from that in which the tube 15 is received. This tube is pivoted, as shown at 16, between parallel ears 17 on the hollow member 18, which latter is provided with a sound passage forming a continuation of the sound passage in the said tube and is adapted to be connected with a sound amplifying horn or other sound conveying means (not shown). The tube 15 is capable of a considerable movement about the pivots 16; so that my improved device is capable of adjusting itself to records differing in diameter to a large extent. The tube 15 is formed with a



lateral opening 19 adapted to register with the opening 13, 14 and also with an opening 20 adapted to register with the opening 10, these openings in the said tube being so arranged that when one of them is in register with its corresponding opening in the slide, the other opening in the slide is closed by the tube. With this arrangement, communication from the reproducer to the sound conveyer is shut off when the recorder is in operative position, and vice versa. In Fig. 1, the recorder is shown in operative position with the stylus 2' in engagement with the surface of the record 21 and the interior of the recorder in communication with the sound conveying tube 15, the reproducer being in inoperative position and out of communication with the interior of the sound conveying tube 15.

In order to prevent rotation of the slide 3 on the tube 15, I provide a screw or other similar guide 22 secured to the tube 15 and having its shank extending through a longitudinal slot 23 in the slide 3. This slot is made of such a length that the ends thereof when brought into engagement with the screw 22, limit the movement of the said slide on the said tube so as to position the openings 19 and 20 respectively in register with the corresponding openings in the slide 3.

In order to provide convenient means for shifting the slide 3 on the tube 15, I pivot a lever 24 as shown at 25 to one of the ears 17 on the member 18 and connect the upper end of this lever, as by a link 26, to the said slide. The numerals 27 and 28 represent screws or other suitable means for connecting the ends of the link 26 to the lever 24 and to the slide 3 respectively. The opening in the link 26 through which the member 28 passes is preferably slightly elongated as shown at 29 to permit the slide to move to a limited extent without imparting its movement to the lever 24.

In order to prevent damage to the surface of the record or to the stylus in engagement therewith, while shifting from one instrument to another, I provide means for elevating the tube 15 and the parts carried thereby during such shifting. In the embodiment of my invention shown, I employ a lever 30 pivoted as at 31 to a fixed part of the traveling carriage (not shown), the upper surface of this lever being formed with a cam surface 32 adapted to be engaged by the pin 33 on the lower arm of the lever 24. The pivot 31 is located to one side of the vertical plane passing through the center of the pivot 16, and the cam 32 is so shaped that when the lever 24 is swung from either extreme position to midposition, the upwardly extending finger 34 on the lever 30 comes into contact with the lower surface of the tube 15, and raises the latter,

the said tube and the portion 34 of the lever 30 being permitted to drop when the lever 24 passes beyond its midposition. As shown in the drawing, the lever 30 moves a slight distance before contacting the tube 15, the clearance thus provided, together with that obtained by the slot 29 permitting my improved device to adjust itself to the irregularities in the record surface without affecting the lever 24.

As stated above, my invention also contemplates the provision of means for rendering inoperative the mechanism for feeding the traveling carriage (not shown) and the reproducer and recorder and other parts supported by said carriage across the record surface, these means operating simultaneously with the shifting from one instrument to the other. As shown, the feed nut 35 is supported by lever 36 pivoted to a member 37 secured to the traveling carriage (not shown). A spring 38 connected to the said lever 36 and the lower end of the member 37 tends normally to hold the feed nut 35 in engagement with the feed screw 39. The arm 40 of the lever 36 is provided on its upper surface with a cam 41 adapted to be engaged by the lower end of the lever 24 whereby movement of the lever 24 causes the nut 35 to be raised out of engagement with the screw 39. The cam 41 is provided with a depressed central portion for holding the lever 24 in its midposition and is formed to permit engagement of the nut 35 with the screw 39 when the said lever 24 is in either of its extreme positions.

Many modifications may be made in my invention without departing from the spirit thereof and I wish, therefore, not to be limited to the exact details shown and described.

What I claim as new and desire to protect by Letters Patent is as follows:

1. In a phonograph, the combination with a recorder and a reproducer, of a slide supporting the same, a support for said slide, and means for simultaneously shifting said slide on its support and elevating said support, substantially as described.

2. In a phonograph, the combination with recording and reproducing means, a slide for supporting the same, a pivoted support for said slide, and means for simultaneously moving said slide on its support and elevating said support, substantially as described.

3. In a phonograph, the combination of a slide having a hollow interior, a movable support therefor, a recorder and a reproducer each supported by said slide and provided with a separate sound box communicating with the interior of said slide, and means for simultaneously moving the said slide on its support and elevating said support, substantially as described.

4. In a phonograph, the combination of a

slide, a recorder and a reproducer supported thereby and each provided with a separate sound box, a movable support for said slide provided with a sound conduit adapted to be brought into communication with either of said sound boxes to the exclusion of the other, and means for simultaneously shifting said slide on its support and elevating said support, substantially as described.

5. In a phonograph, the combination of a slide, a recorder and a reproducer supported thereby and each provided with a separate sound box, a pivoted support for said slide provided with a sound conduit adapted to be brought into communication with either of said sound boxes to the exclusion of the other, and means for simultaneously shifting said slide on its support and elevating said support, substantially as described.

6. In a phonograph, the combination with a recorder and a reproducer, a slide supporting the same, a support for said slide, means for imparting a progressive movement to said support, and means for simultaneously shifting said slide on its support, elevating said support, and rendering said movement imparting means inoperative, substantially as described.

7. In a phonograph, the combination of a slide, a recorder and a reproducer supported by said slide and each provided with a separate sound box, a pivoted sound conveyer supporting said slide and adapted to be brought into communication with either of said sound boxes to the exclusion of the other, means comprising a feed nut and a feed screw for imparting a progressive movement to said conveyer, means for simultaneously shifting said slide on said conveyer to bring either sound box into communication with said conveyer, elevating said conveyer, and disengaging said feed nut from said feed screw, substantially as described.

8. In a phonograph, the combination with a recorder and a reproducer, a slide supporting the same, and a movable support for said slide, of a single actuating means, and connections from said means for shifting said slide on its support, and for elevating said support, substantially as described.

9. In a phonograph, the combination with a recorder and a reproducer, of a slide supporting the same, a support for said slide, and means for imparting a progressive movement to said support, of a single actuating member, and connections therefrom for shifting said slide on its support, for elevating said support, and for rendering said movement imparting means inoperative upon the movement of said actuating means, substantially as described.

10. In a phonograph, the combination with a recorder and a reproducer, of a slide

supporting the same and a support for said slide, of an actuating member, means connected with said actuating member for shifting said slide upon its support, and a lever adapted to be moved by said actuating member to elevate said support, substantially as described.

11. In a phonograph, the combination with a recorder and a reproducer, of a slide supporting the same, a support for said slide, and means for imparting a progressive movement to said support, of an actuating member, a lever for elevating said support, and connections from said actuating member for simultaneously shifting said slide on its support, actuating said lever to raise said support, and rendering said movement imparting means inoperative, substantially as described.

12. In a phonograph, the combination of a slide, a recorder and a reproducer supported by the said slide and each provided with a separate sound box, a pivoted sound conveyer supporting said slide and adapted to be brought into communication with either of said sound boxes to the exclusion of the other, means comprising a feed screw and a feed nut for imparting a progressive movement to said conveyer, a lever for elevating said sound conveyer, and an actuating lever connected with said slide and adapted to simultaneously shift said slide on said conveyer to bring either sound box into communication with said conveyer, to actuate said first named lever, and to disengage said feed nut from said feed screw, substantially as described.

13. In a phonograph, the combination of a slide, a recorder and a reproducer supported by the said slide and each provided with a separate sound box, a sound conveyer supporting said slide, means comprising a feed screw and a feed nut for imparting a progressive movement to said conveyer, a lever for elevating said sound conveyer, and an actuating lever connected with said slide and adapted to simultaneously shift said slide on said conveyer, to actuate said first named lever, and to disengage said feed nut from said feed screw, substantially as described.

14. In a phonograph, the combination with a recorder and a reproducer having separate sound boxes, of a slide supporting said recorder and said reproducer, a support for said slide, and means for simultaneously shifting said slide on its support and elevating said support, substantially as described.

15. In a phonograph, the combination of a slide having a hollow interior, a movable support therefor, a recorder and a reproducer supported by said slide and communicating with the interior thereof, and means for simultaneously moving said slide

on its support and elevating said support, substantially as described.

16. In a phonograph, the combination of a slide, a recorder and a reproducer supported by said slide, a movable support for said slide provided with a sound conduit adapted to be brought into communication with either said recorder or said reproducer, and means for simultaneously shifting said

slide on its support and elevating said support, substantially as described. 10

This specification signed and witnessed this 4th day of October 1911.

NEWMAN H. HOLLAND.

Witnesses:

ANNA R. KLEHM,

JULIUS H. POHLMAN.

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